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Roger Pearson
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The Relevance of Naval Theater Missile Defense

Eugene Fox and Stanley Orman
Orman Associates, Alexandria

Despite the potential capabilities of Naval Theater Missile Defense (TMD) for providing a genuine area defensive system for America and its allies, a review of the development program indicates that the U.S. Naval capabilities continue to be less well supported than some of the Army's ground-based systems. This article examines the issues that have contributed to the present situation, and concludes that there are a number of unique features of the Naval capabilities which would significantly enhance the overall robustness of a missile defense. The article also examines the influence of the restrictions of the Anti-Ballistic Missile (ABM) Treaty on systems which are designed to provide area defense, concluding that effective defense and Treaty compliance are incompatible. This is an issue that will have to be confronted by the U.S. Congress and the Administration, if monies allocated to TMD are to he spent wisely.

Key Words: Missile defense, naval TBMD, ABM treaty, Allied TMD

There are several reasons why Naval Theater Missile Defense (TMD) has been advocated as a means of providing missile defense for crisis areas around the world. The launch platform is part of a system that is routinely deployed widely, and can be transported rapidly to problem areas, without competing for limited air cargo space. A Naval system also avoids the problems of negotiating landing rights with nations that might be concerned about retribution from aggressors, and at the same time adds a robustness to the total defense. Despite these distinctly attractive projected capabilities, the development of Naval interceptors appears to lag behind some of the Army's ground-based systems. It is also noteworthy that no allied nations have yet shown any inclination to invest in equivalent programs. With the degree of threat proliferation now being observed, it seems important to assess the reasons why a Naval TMD system has not been more strongly supported.

The objective of this article is to review the potential capabilities of Naval TMD, together with the likely timescales for its introduction into service, and its relevance for America and its allies. Because of

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budgetary constraints, it is clear that too many competing systems are currently in development in the American program for them all to be acquired in the same timeframe, or perhaps at all. Some hard decisions will have to be made shortly to allocate and enforce a priority among these competing programs. This article aims to examine the issues that will have to be considered in arriving at these decisions.

The Specific Capabilities Of Naval TMD

Traditionally the role of defending troops and military facilities from air attacks with ground-based defensive systems has been undertaken by the U.S. Army. By extension of this traditional role, development of ballistic missile defenses has been an Army program for almost 40 years, and has led to the acquisition of Pac 3, which will be the first genuine anti-ballistic missile system to enter U.S. service. With this long Army background, there has to be some special reasons for the Navy to take a major role in a TMD program that has been dominated for so long by another Service. These particular characteristics are examined here, without regard initially to the status of development of the systems. That equally important aspect is not overlooked, and will be examined in a later section of this article.

The principal objectives of acquiring a TMD are to deter a potential enemy from acquiring and/or using missiles against us, and providing an active defense should deterrence and diplomatic means fail to avoid a conflict. To meet these objectives, a defensive system has to possess several characteristics, amongst the most important of which are:

1. The defense should be effective, and have demonstrated that effectiveness in well publicized trials.
2. The defensive systems should be in place, or readily transportable to any geographic location in which they might have to be used.
3. The defense should have sufficient range to intercept attacking missiles, well away from their intended target. Ideally missiles should be destroyed as soon as possible after launch, so that the debris returns from whence it came.
4. The defense should be robust, without any easily exploitable failure modes.

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One of the most tantalizing questions that the Strategic Defense Initiative (SDI) program, initiated by President Reagan in 1983, attempted to answer was how to use emerging technology to provide defense in depth against ballistic missiles. It was recognized from the outset that the defense of major cities could only be accomplished if the bulk of attacking missiles could be destroyed early in flight, leaving only leakers to be intercepted over the territory of the defending nation. A problem that has plagued the missile defense community since is how to achieve effective boost phase intercept. Early efforts were concentrated on directed energy weapons, using lasers and particle beams. Such systems could only fully be effective, in terms of operation over thousands of miles, if deployed on satellites beyond the atmosphere. The engineering problems associated with their deployment and operation has made them untenable for the foreseeable future, with the possible exception of an airborne laser, which is still a technology activity. When it became obvious that these exotic systems could not provide a near-term solution, attention turned to the utilization of a constellation of small autonomous satellites, that could be individually commanded and guided onto a collision course with the attacking missiles, as they reached exo-atmospheric elevations. This concept, known as Brilliant Pebbles, had many attractive possibilities, but it proved to be politically unacceptable, and development was stopped.[1]

The Navy Theater Ballistic Missile Defense (TBMD) program is the first fully practical proposal to offer a solution to this early interception requirement. It does so by taking the defensive launch platform, the ship, as close as possible to the likely launch area of the attacker. A ship has the advantage of being able to operate in international waters, without needing any host country's support, basing rights, or overfly agreements. The location of each ship dictates the interception mode in which it could operate; ascent phase, mid-course, or terminal. In practice more than one form of interceptor would be required to perform these multiple tasks, but the principle remains that the major advantage contributed by the Navy to Theater missile defense is the mobility of the defensive

[1] E. Fox & S. Orman "The Art Of Diplomacy With Tunnel Vision" *Defense & Security Review*, p 128- 133 1994

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launch platform.

The Navy brings a second important capability to BMD; this is the experience of integrating several, separate operating systems into a family of systems. From its conception, the Aegis system has been designed to ensure that a Carrier Battle Group can operate as an integrated entity. The ability to obtain a comprehensive air picture and utilize this for the command and control functions has been demonstrated recently in some tests of a Cooperative Engagement Capability (CEC). This nets sensor information from disbersal units into composite tracks with fire control accuracy, a capability that will prove to be essential for an effective multi-tier missile defense.

In these two areas – of platform mobility, and integration of the different component systems into a family of systems, from the design phase through to operation – the Navy appears to offer unique capabilities. These conclusions are drawn solely from the way in which the system would be used, provided the development program can be satisfactorily concluded. The next important step therefore is to examine the development program to ascertain whether the promised advantages are likely to be achieved, and in what timescale.

The Naval Development Program

As noted earlier, the Navy have been comparatively late entrants into the TMD program. It was only after the collapse of the former Soviet Union that circumstances forced the Navy to re-examine their more traditional role and recognize that, in the new World order, new and different tasks would have to be taken on board. In the Aegis system, the Navy has an investment exceeding $40 billion in ships and equipment, providing the most modern naval offensive and self protection systems. This force includes 22 cruisers and 35 destroyers, with a total of nearly 6,000 vertical launch cells between them. On the above-surface self-protection side, the equipment includes search and tracking radars, advanced BMC3 systems, and a Standard Missile, now at modification level Block IV, for protection against air-breathing threats. It was recognized that modification to some of these systems could produce an effective, mobile TMD capability. The missile defense would represent an evolutionary step, continuing to utilize proven hardware and battle-tested systems.

By the time the Navy was prepared to offer its TMD concepts, the American Ballistic Missile Defense research activities were well-

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advanced. As was noted earlier, Army programs dominated, and significant funding had been expended on ground-based systems such as Pac 3 and THAAD. The latter incorporated a totally new missile and a new phased array, X-band radar. The Navy have been playing catch-up ever since, and their programs still lack the level of budgetary support enjoyed by the longer-running Army programs.

For some time the Navy proceeded with two separate programs, roughly coinciding with lower and upper tier capabilities. These are now designated Naval Area TBMD, and Naval Theater Wide TBMD, respectively. In practice they are now coalesced into one program. The Area TBMD represents the first series of modifications to provide a limited capability, until joined by the higher-altitude interceptor which would enable a much larger area to be protected.

Because Aegis ships are deployed worldwide, they have been able to collect data on foreign missile launches. These experiences have confirmed that minor modifications to the SPY radar, already programmed and funded, will enable autonomous and cued detection and tracking of TBMs at the extended ranges necessary for successful engagements. To meet the interception requirements, modifications have been made and successfully tested on the Block IV Standard Missile to raise it to Block IVA. The missile has been given a modified warhead, a new IR seeker, and a new fuse. The early testing indicates that targets will be destroyed up to high endo altitudes, indicating a capability at least equivalent to that of Patriot Pac 3.

The program for the Naval Area TBMD will yield a demonstration of the tactical system in 2000 and a limited initial operating capability by 2001. At this stage, with nothing yet deployed capable of intercepting TBMs, any addition to the point defense which will be provided from 1999 onwards by Pac 3, should be welcomed. Moreover there is so much commonality between the Area TBMD and the Theater Wide TBMD that the former could be considered as the equivalent of an advanced User Operational Evaluation System. This is a concept that has also been an objective of the THAAD designers, as a means of getting something to the field early.

The present schedule for the Theater Wide system has a first unit equipped in 2006, even though the future budget allocations suggest that the Pentagon is not yet fully committed to the program. For the past four years, Congress has added significantly to the

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President's budget request for this Naval Theater Wide TBMD. The additions for the past two years have exceeded $200 million. Unfortunately, when planning complex development programs, future commitments cannot be made on the assumption that these plus-ups will continue indefinitely. Prudently therefore the program presently predicts an annual expenditure less than half that of 1998, for fiscal years (FYs) 99-03. This is not the most effective way to pursue an important national program, but without being accorded a higher priority there is little that can be done other than to plan within the allocated resources.

Two factors bear most heavily on this apparent lack of willingness to support the Theater Wide TBMD more strongly. One is the general over-demand for funds from the many programs now being supported by BMDO, while the second is more specifically directed to the Naval activities, and relates to the comparatively late recognition of the potential TBMD capabilities of the Aegis system. As was noted earlier the Army had a significant program in hand before the Navy program was fully defined.

Statements by DOD officials indicate that it has been recognized for some time that all the development items currently in the program would not be able to proceed into an acquisition phase in the same timescale, around the FYs 2000-05. Nonetheless the desire to keep them all funded suggests that the current objective is to sustain everything, until front runners clearly emerge. The downside of this policy however is that delaying prioritization slows progress, while adding to the overall cost. Management should be prepared to make hard decisions early, and through prudent control ensure that the desired objective is achieved. The lack of cohesiveness between DOD and Congress in the whole area of BMD, has certainly made good management of the program more difficult. It is still unclear how priorities are established and enforced. The absence of a clearly defined decision making chain of command has reduced the accountability of each of the agencies involved, while adding to the development timescale, and significantly increasing the overall cost.

The Influence of the ABM Treaty

From the outset it should be understood that the ABM Treaty was specifically designed to restrict Strategic defenses and was never

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intended to limit Theater systems[2]. Since the Treaty was signed in 1972, technology has developed to an extent whereby some offensive Theater systems now approach the capability of those that were originally considered Strategic. The deployment of a Theater defense could only be justified if it had an adequate capability against these modern missiles. The incompatibility that then arises is that such a defense would also have some residual capability against Intercontinental, or Strategic, Ballistic Missiles, and hence fall into an uncertain area in terms of compliance with the ABM Treaty.

The description given earlier of the capabilities of the Theater Wide TBMD was based on the assumption that the full potential of the system could be developed as conceived and utilized without artificial restrictions. This description was generated without regard to limitations which might be imposed because of possible interpretations emanating from the ABM Treaty. The policy of the Clinton Administration has been to maintain strict adherence to the ABM Treaty because of its perceived relationship to arms control agreements with Russia, governing offensive systems. As a result, American and Russian officials have spent four years negotiating demarcations between Theater and Strategic defense systems, as they relate to the Treaty. In March 1997 at a Clinton-Yeltsin summit in Helsinki, several agreements are reported to have been made, including some which could jeopardize the capabilities of the Naval Theater Wide system.

There is still some uncertainty regarding the exact nature of the agreements reached during the March 1997 Summit. According to press reports,[3&4] interceptor velocities would be limited to 3 km per sec., and space cueing of interceptors would be excluded. In a March address to the Navy League, Secretary of Defense Cohen stated that the development, testing and deployment of TMD systems would not be inhibited by any agreements made at Helsinki.[5] He claimed that there would be no limitation placed on interceptor speed, while

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[2] U.S. Arms Control & Disarmament Agency, Arms Control & Disarmament Agreements: Texts & Histories of Negotiations, U.S Government Printing Office, Washington D.C. 1982.

[3] K. Payne, *Defense News*, April 21-27 1997

[4] D. Smith, *Defense News*, October 20-26, 1997

[5] W.S. Cohen, Address to Navy League, Washington D.C. March 27, 1997

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acknowledging that test targets would be constrained to velocities of 5 km/sec, and ranges of 3,500 km. He did not address the issue of space cueing. To meet its full design potential, the Naval Theater Wide System would have to achieve velocities greater than 3 km/sec., and make full use of the Cooperative Engagement Capability, which in turn would incorporate space cueing. The whole concept of accepting limitations on the capabilities of a defensive system seems to be unrealistic, regardless of the accuracy of the conflicting reports of the precise nature of those limitations. The Senate should certainly ensure that nothing that could degrade the design capabilities of the Naval TBMD systems should be incorporated into a modified ABM Treaty.[6]

There can be no doubt that retention of the ABM Treaty is incompatible with effective area defense, which in turn is necessary for population defense. This is hardly surprising, since the Treaty was conceived for the very purpose of ensuring continued vulnerability to missile attack, so that the policy of Mutual Assured Destruction provided a deterrent to the use of offensive nuclear systems. Technological advances will continue to blur, if not eliminate the differences between Theater and Strategic systems. Furthermore, given time, other nations will extend the range of their missiles to a level that will enable them to threaten the U.S. mainland. Well before that point is reached, the U.S will want to have a National Ballistic Missile Defense in place. All this indicates that attempts to modify the Treaty to distinguish artificially between Theater and Strategic missiles are misguided and futile. Until this truism is recognized by the political leadership of America and its allies, their nations and their troops will remain less well protected than development programs are demonstrating is achievable. The deleterious effects of the ABM Treaty limitations on the full effectiveness of the Naval systems would be significant.

The Allied Perspective

Successive American Administrations have made valiant efforts since the mid 1980's, to keep allies informed of developments in SDI

[6] "Critics say Clinton accepted too many restrictions on TMD," BMDO *External Affairs Digest*, March 26, 1997

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and BMD activities. Joint studies have been funded by DOD and invitations have been extended to join specific American programs.[7] Despite this twelve year history of offering cooperation, there is only one joint program currently underway, and even that has been threatened with cancellation by Congress at each annual budget cycle, and has received lukewarm support within the Pentagon. This program, MEADS (Medium Extended Air Defense System) is a ground-based tactically mobile replacement for Hawk in Europe and Patriot for U.S. forces, designed to provide forward defense against air-breathing and ballistic attacks. MEADS is a joint effort involving America, Germany and Italy. Of the other allies, only Israel has a substantial program of its own, and on current schedules will have a layered missile defensive system deployed even earlier than America. Thus with the sole exception of Israel, it has to be admitted that attempts to encourage allied participation in BMD have so far met with very limited success.

There are many inter-related reasons why the allies have shown so little interest in BMD, and several articles have been written analyzing these.[8&9] Some of the principal issues suggested have been the size of the investment required, the effectiveness of the defense that could be achieved, and the residual conviction that America will either deter an attack by threat of nuclear retaliation, or provide protection should hostilities occur. Without digressing too far to consider these in detail, it is surprising that allies do not yet seem to have recognized that the financial pressures on the American BMD programs that will prevent them fielding all the systems presently in development will similarly inhibit the size of the buy of each system. It is already obvious that there will be insufficient numbers in the intended acquisition to provide simultaneous protection for allied and U.S. resources. The projected force levels are inconsistent with the American policy statements that TMD will provide protection for US and allied forces operating jointly out-of-area, and for allied populations. The allies need to understand that while they could receive assistance from America to enhance their own defensive

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[7] S. Orman, "Faith in G.O.D.S." Chapter 8, Brassey's (UK) Ltd. 1991.

[8] E. Fox & S. Orman, *RUSI Journal* p. 23-27, June 1996

[9] E. Fox & S. Orman, *Journal of Social, Political & Economic Studies* Vol 22, No. 3 p. 259-265, 1997

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capabilities, there is currently no provision to furnish them with a defense.

The Naval program offers a significant opportunity to allay the fears of the allies regarding both the size of the investment required and the effectiveness of the solution. But activities will have to be initiated rapidly if the opportunity is not to be lost as a result of proposals now before other Governments. For example, it has been revealed that contracts for the Principal Anti-Air Missile System (PAAMS) for the new generation frigate being jointly developed by Britain, France and Italy will be awarded in 1998. Apart from the fact that, for what appears to be political rather than technical reasons, each national Frigate will use different radar systems, the interceptors will be the Aster 15 and 30 surface-to-air missiles being developed by France and Italy. These would provide only local area and point defense capabilities, significantly inferior to those claimed for the Naval Theater Wide System.

If cooperation with allies means anything, it should mean the ability to operate effectively together in war as well as in peace. This requires a degree of interoperability of equipment, which is just as important as securing prior agreement on diplomatic and political activities, and on rules of engagement. The greater the commonality of equipment amongst allied forces, the easier it will be to achieve the level of integration and interoperability required to avoid the type of surprises that arose in the Gulf War, when the use of one nation's radar adversely affected the operation of another's. The Naval systems, for all the reasons outlined earlier, would provide that commonality, in addition to enabling allies to acquire a missile defensive system that meets the dual requirements for a Strategic as well as a Theater defense. It should not be forgotten that many allied homelands are already within range of the offensive missiles of potentially hostile nations. These allies no longer have the luxury of waiting for the next product improvement before being threatened. Despite their obvious reluctance to acknowledge the fact, they need an effective area defense system. The high population-density of Europe and the comparative smallness of the countries means that individual national missile defenses could not be nearly as effective as a combined force. If nothing more, such a combined operation could attempt to limit the collateral damage that would be caused by showering the debris of intercepted missiles on neighboring nations.

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The Naval basing of a defense system would provide Europe with the space and the time lines to achieve effective defense while minimizing collateral damage. If such a system were designed from the outset to be capable of operating in an integrated manner with American systems, the allies would indeed have both a deterrent, and an actual defense should deterrence fail. The Naval system, by virtue of its mobility, would simultaneously provide Theater and Strategic defense. The commonality of systems would enable allies to assist American operations worldwide as easily as America could assist in the defense of Europe. In addition to these sound operational issues, the avoidance of developing and procuring two separate systems for Theater and Strategic defense would reduce the shared investment to affordable levels.

The case made for Naval systems for Europe applies even more strongly to Japan, which currently possesses Aegis cruisers and so has already invested in common equipment. Any threat to Japan would of necessity be travelling over water, and the earlier and further out the attacking missiles are first intercepted, the more effective the resulting defense. The value of a Naval area defense system for Japan is so much greater than could be obtained from a ground-based system, that with other aspects being equal, there is no case to consider anything else.

In summary, it appears that the Naval route could provide a win-win solution for America and its principal allies. As noted above, however, not only is time short; that precious commodity is being wasted by indecision. It is now abundantly clear that most allies have probably avoided investing in BMD more on the grounds of uncertainty of the cost and effectiveness of a defense, than on a reluctance to recognize the growing threat. The longer the American Administration takes to make the hard decisions on allocating priorities between the competing programs, the greater the overall U.S. cost will be, and the less likely it will be that allies could be induced to participate. They will interpret lengthening timescales and increased cost as being due to the complexity of achieving the desired result. The analysis earlier indicated that successful development of the Naval systems could provide an effective, integrated defense, at an affordable cost. A decision to give appropriate priorities to this route would therefore not only enable the acquisition of an effective American TMD, it could result in a greater opportunity to achieve

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interoperability and integration with the allies in the defensive system of the future.

Attractive as the proposition sounds, it should not be thought that merely making decisions to allocate the appropriate priority and funding to the U.S. Naval programs will lead to an influx of allied interest. There have been far too many changes of direction in the U.S. BMD programs over the past few years for this alone to draw in the allies. The changes would have to be backed by firm commitments between Congress and the Administration to maintain the changed priorities, and to sustain a genuine international activity. The window of opportunity is there but, as noted, it is unlikely to stay open for long.

Summary

The Naval TMD undoubtedly has the potential to overcome some of the limitations inherent in the design of the Army systems currently under development. This does not diminish the value of the Army contribution, but indicates that the capability of the defense would be enhanced significantly by the early inclusion of the Naval systems, which would add substantially to the overall robustness.

The mobility of the launch platform adds greatly to the speed and ease of deployment to crisis areas. In addition, the problems of acceptability to a host country can be totally avoided, thus adding considerably to the ease with which military decisions can be made.

The Naval systems offer the only near-term solution to ascent-phase interception, which as described earlier is a vital feature in the provision of effective area and population defense.

None of these promises can be fulfilled until the Naval TMD program is accorded the priority and funding to enable the development to be completed in a timely fashion. At the present time the timescale is dictated more by funding uncertainty than by technical requirements.

The way these issues are dealt with will reveal how the American Administration intends to resolve the dilemma associated with BMD. The Administration appears to believe that there can be compatibility between an effective defense and ABM Treaty compliance. At some point in the future, if not already, this may no longer be true. There will be risks we do not fully understand, or even know about. The Naval systems now offer a litmus test, because in

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addition to promising a more effective, integrated defense than the Army systems alone, they pose some real challenges to the ABM Treaty. The manner in which Congress and the Administration react to this challenge will indicate to the American public how these priorities are being addressed.

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Making Warfare Acceptable: Nonlethal Strategies

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The authors examine the prospects for developing new technologically advanced weaponry which will render opponents incapable of effective military action, thus reducing the need for high casualties in combat.

Key Words: Psychological warfare, chemical and biological warfare, electronic warfare, information warfare,

The effort to make war palatable has been one of our most determined undertakings for at least a century. The Hague Conferences and the Washington Naval Conference are among the most notable early attempts to control the conduct of hostilities. With the development of nuclear weapons, the challenge seemed almost hopeless yet scholars such as Herman Kahn attempted to develop a war-survival strategy that would guarantee that the survivors would not envy the dead in the aftermath of atomic war.[1] The eventual proliferation of these weapons of mass destruction led to the formulation of strategies for the avoidance of nuclear war and the nuclear age has been characterized by frequent wars which have employed conventional or non-nuclear weapons.

In spite of our avoidance of a much-dreaded nuclear holocaust, the use of conventional weapons generated a new chorus of critics who raised questions about the impact of these non-nuclear devices. These critics were spurred on by advent of new technologies, radical advances in medicine and constant media surveillance. This new concern has overshadowed our fear of the traditional nuclear doomsday scenarios and demanded the development of nonlethal or simply disabling weapons for use in aggressive and defensive

[1] Herman Kahn, *Thinking About the Unthinkable*, (New York: Avon Books, 1962), pp. 19-39.

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scenarios.

Defining Nonlethality

The very terminology associated with the concept of nonlethal weapons has created controversy over its definition as well as its philosophical justifications. The term "weapon" generally refers to something designed to cause bodily harm and/or destruction of inanimate objects. The term "nonlethal" implies absolute zero fatalities but, since that is an unrealistic goal, these weapons are often referred to as "less than lethal" or "sublethal". By their very definition, this new level of weapon implies that conventional anti-personal weapons are lethal, when in fact most are not. Rifles, for example, only inflict a 20%-25% causality rate and, while they may blow off a foot or otherwise maim a person, antipersonnel mines often fail to kill their victims. These considerations have raised ethical questions as to whether it is more humane to disable the enemy rather than kill them.[2]

During the early days of the Cold War and the US-Soviet arms race, official stress was placed on greater lethality. National security was measured against an overkill capacity that assured us of our ability to mount a second strike against any attacker. In that era, technology was devoted to increasing our overkill capacity by creating increasingly destructive weapons. Technology now moves in a different direction and, as noted above, stress is also placed on the development of an arsenal of non-lethal weapons to supplement the traditional, lethal devices.

This new concern has prompted an emphasis on development and research on nonlethal weaponry. Implications of the effects of these weapons have been debated within numerous international organizations and, as a result of the subsequent pressure, blinding laser weapons were prohibited at a United Nations conference in 1995. Should the Chemical Warfare Convention be ratified by the United States Senate, there would be new restrictions that would affect some nonlethal categories. However, while the debate continues and organizations such as the International Committee of

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[2] Janet Morris and Chris Morris, ***Nonlethality: A Global Strategy*** (West Hyannisport, Mass.: Morris and Morris, 1994), pp. 3-21.

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the Red Cross voice concern and even suspicion, there have been no further international treaties banning the future development or employment of any other non-lethal weapons.

Advantages of Nonlethal Weapons

There are, of course, many advantages associated with this new type of weaponry. One positive attribute of nonlethal weaponry is its variable utility. It can be used by civilian law enforcement agencies as an alternative and more humane way of handling civil disturbances such as crowd control, riots, hostage situations and the apprehension of violent criminals. In the military realm, non-lethal weapons have been successfully deployed by United States forces during the Gulf War, in Somalia, in the occupation of Haiti and in the former Yugoslavia. The results of nonlethal weapons may be regarded as "life preserving" and, in many respects, environmentally friendly while their lower costs lends the appearance of fiscal responsibility. It is likely that there will be an increased use of non-lethal weapons as demands increase for humane intervention in various conflicts. The United States and various regional security organizations will need non-lethal means to intervene and support peace keeping missions. Thus, research into this type of weaponry will continue to be supported by both private and governmental agencies.

The Role of Technology

The demand for different weapons systems has been aided by the same technological innovations that have had such a dramatic impact on society at large. The impact of new technologies on military science has been equally dramatic and, as a result of innovations that have been traditionally viewed as civilian in their applications, military affairs in the latter 1990s seem to have little in common with those of the immediate post-war years. Technology, it seems, is affecting every aspect of society with equal force.

Yet, as a whole, these innovations are not only a blessing but, in many important ways, a curse. It is true that, collectively, they enhance our working effectiveness but it is equally true that they can disrupt commercial, governmental, financial, and social operations which are vital to our ability to function as a modern, secure state.

Taking into account that one of the most fundamental military concerns is the maintenance of an effective system of

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command and control, it is easy to see the inevitability and desirability of the technological modernization of military operations. For military commanders, the introduction of computer technology had an immediate, beneficial impact. As a result, a military establishment which had once been maligned for a dependence on outmoded methods of communication soon became a national leader in the introduction of this device into its routine operations. New military occupation specializations were quickly created as a means of insuring the highest level of proficiency among those service members responsible for computer operations. To this extent, we have become beneficiaries of technological progress.

The growth of technology has also contributed to the creation of a very broad range of nonlethal weapons in use today. Some involve the utilization of the most advanced technologies while others are rather unsophisticated in conceptual if not technological terms. In the latter category, one finds a variety of pepper sprays, CS gas, Mace, plastic bullets, glue guns, water cannons, obscurants, and anti-personnel foams. Most of these are inexpensive and available to military forces, police agencies, and even private citizens.

Technological Vulnerability

Society's advances in the application of science, what we commonly refer to as technology, brought enormous benefits. Some of these are reflected in extended life expectancies, increased comfort in our daily lives, a level of material productivity unmatched in history, greater and more immediate access to information, and a greatly enhanced and sophisticated degree of national security. Yet, as noted above, there have also been negative aspects associated with the growth of technology and many of these threaten our national security. Events of recent years have created an awareness of the extent to which power grids, transportation networks, financial systems, and telephone exchanges can be disrupted by invisible computer assailants who, without any personal risk, can reach the most remote and vulnerable locations.

The starting point in our arrival at this situation began, at least in part, with efforts to create an apparatus that could perform basic, simple functions that had previously taken individuals countless hours. What began as a large machine which received data entered on cards evolved into an interactive device which allowed the user to

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sit at a terminal and view a screen upon which results might be displayed. Given the enormous costs of such devices, there was a natural interest in linking them and thus creating a network fundamentally unlike anything which existed before.

Eventually, military and civilian information systems became part of a unified network. This linkage created one of our most immediate technological vulnerabilities. Modern warfare uses an incredible amount of resources. One of the most important and expensive of those resources is data. Military operations cannot be conducted without data about your resources, enemy resources, the terrain upon which engagements are to be fought, and the intentions of your adversary. Today, every military organization of any size or importance requires the maintenance of a sensitive, compartmentalized information storage facility to serve as a repository of some of the data essential for military planning and operations.

Recognition of the importance of military information systems is reflected in the frequency of attacks on those systems. According to a recent study, there are 250,000 attacks each year and, while almost all of these penetration efforts fail, the few that are successful have enormous and expensive consequences. Within governmental circles, computer security has emerged as an increasingly important and vital specialization while commercial establishments have learned that their competitive advantage is almost as much a function of effective information security as the creation and marketing of an attractive product.[3]

The development of such a simple device as the computer modem greatly increased the vulnerability of computer networks. As a result of such devices, those who wish to violate the security of a massive and sensitive computer network can do so from the comfort of a distant and relatively secure base. In the past, sabotage efforts generally required some form of entry to facilities that were likely to be very well guarded. Protective measures could be increased as the sensitivity and value of the installation increased. The terrorists who sought to disrupt its operations were, therefore, faced with a greater

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[3] Zachary Selden, "The Implications of Cyberwar for National Security and Business", *Infowar.com*, November, 1996.

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danger of detection, capture, and failure. Warfare conducted against modern information systems operates under different conditions. Unless someone involved in such an action is careless in talking about what he may have done, authorities are unlikely to expose or apprehend the attacker. Each year, unidentified hackers are demonstrating not only the technical skills required to effectively cripple a large government agency but also the ability to elude detection.

Debates About the Application of Nonlethal Weapons

Of course, the technology that has been essential in facilitating the transformation of war-fighting capabilities and has accelerated the modernization of military strategy has not been developed without serious costs. One of the most important is the fact that, in addition to creating new opportunities for military strategy, it also has sown confusion among the military services charged with the application of new technologies. The resultant inability to agree upon a rigorous definition of nonlethality illustrates one difficulty in grasping the full implications of modern military weaponry. The term is also somewhat confusing because there is a point at which many nonlethal weapons may start to have a lethal impact.

The debate over the definition of nonlethality is important because the definition determines more than our understanding of the concept. It has a very practical application in terms of the development of training and doctrine about how to implement this technology and how to integrate the new technology with the traditional ones. When special operations first gained acceptance within the military and governmental community, what ensued was a debate over which services would control special operations. A similar debate has been associated with the advancement of the concept of nonlethal weapons. Resolution of that debate will determine who will be the users of this technology and, ultimately, how it will be integrated into our overall military strategy.

In spite of the lack of precision over a definition, there is agreement that there are two basic categories of nonlethal weapons. Often easiest to develop and certainly the most politically acceptable are those which are designed as anti-matériel. A second nonlethal category are the anti-personnel weapons which target individuals who

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may be uniformed as well as non-uniformed. It is in this category that we find the sinister-sounding "mind control" devices which have been the subject of great discussion among groups suspicious of governmental intentions.

One of the most fundamental points of agreement in defining nonlethal weapons is that they are weapons intended, not to kill or in some way physically destroy an enemy, but rather to inhibit the enemy's ability to fight. The nonlethal weapon is one which eliminates the destructive potential of enemy weapons and neutralizes the soldiers who would use those weapons. Therefore, nonlethal weapons discourage an adversary or in some way prevent him from resisting your military advances. This may be accomplished by physical or psychological means.

Anti-matériel Nonlethal Weapons

While they are often less sophisticated than some of the more advanced anti-personnel weapons, anti-matériel weapons match their anti-personnel counterparts in terms of effectiveness. Some of the most widely discussed of these are the numerous agents which physically inhibit an adversary from functioning in a military environment. In their most commonly accepted usage, these nonlethal weapons are anti-matériel. By employing numerous modern chemical technologies, military technicians have greatly enhanced the development of non-lethal weapons. Some very effective nonlethal weapons, such as "combustion interferents", are based on the utilization of chemical compounds. The development of "combustion interferants" has made possible the virtual destruction of enemy weapons without directly engaging those forces in combat operations. Air-based assaults can quickly and easily disable entire columns of enemy armor. Exposure to modest concentrations of acetylene will cause diesel engines to have pre-ignition problems that eventually result in the immobilization of the most sophisticated and expensive modern tanks. Behind the front-line troops, another recently developed weapon known as a "chemical metal-embrittlement agent" can have an equally devastating impact on an even wider variety of military resources. This weapon can be employed against second-echelon reserve forces or even against the factories which produce militarily significant hardware. Equally effective are corrosive chemical compounds which can be sprayed on or in front of troop

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convoys. With proper timing, these compounds can prevent troop movements by destroying the vehicles tires.[4]

Another category of anti-matériel nonlethal weapons focuses on the vulnerabilities of sophisticated modern weapons. Many of these are employ different chemical substances to create an effective weapon. One device, delivered by what looks at first glance like a conventional anti-tank artillery round, employs a gelatinous substance, often referred to as "super acid", which destroys the armored navigational systems which allow the crew to "see" as they operate the tank. In the same category are various substances which, like the so-called "Teflon confetti", are designed to inhibit the movements of military vehicles. When applied to road surfaces, these substances make the surface so slippery as to be impassible. At the other extreme in this category are various adhesives which immobilize vehicles by literally gluing them to the ground. Equally effective were the carbon circlets which were used to knock out Iraqi electrical power stations during the Gulf War.[5]

More sophisticated than these nonlethal devices are the various electronic weapons which can have a devastating and disabling impact on enemy forces. During the Vietnam War, U.S. forces sometimes employed helicopters which were equipped with powerful sound systems that would play extremely loud music that was designed to disorient adversaries. This practice represents one very early attempt to develop a nonlethal device that would supplement other military strategies. In 1989, U.S. psychological operations troops in Panama bombarded the Noriega residence with loud, popular U.S. music of a type known to be despised by the classical music-loving Panamanian dictator. More elaborate applications of this tactic now utilize powerful amplifiers that transmit low frequency sound waves that penetrate the walls of military vehicles, causing disorientation and physical illnesses among soldiers who are thereby made incapable of performing their missions. Ultrasound beam weapons can not only cause permanent hearing loss but, when employed with sufficient force, even bring about death. When utilized underwater against enemy divers, these weapons are even more effective.[6]

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[4] David Guyatt, "Killing Me Softly", *Infowar.com*, December, 1997, p. 1.
[5] Ibid., pp. 2-3.
[6] Ibid., pp. 4-5.

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As was noted above, the maintenance of modern information bases relies upon the establishment of sophisticated computer systems that can store and retrieve necessary data. Technologically advanced nonlethal weapons can exploit our dependency on such computer systems with what is often a lethal impact. According to reports, both the United States and Great Britain have developed what is known as a High Energy Radio Frequency (HERF) gun, a device designed to disrupt computers and destroy institutions dependent upon computer operations. There are even rumors that several international banks have been compelled to pay criminals who have threatened to destroy the global computer systems through which those banks must function. There is also speculation that this weapon can disrupt the computer guidance systems of aircraft and thereby produce catastrophic airplane disasters.[7] During the first hours of the Gulf War, electronic warfare technologies provided invaluable protection for U.S. and allied troops by disrupting Iraqi command, control, communications and intelligence capabilities. This advantage allowed those troops to make essential moves without having to face the full onslaught of Iraqi weapons and thereby suffer numerous casualties.[8]

Another powerful electronic weapon exists in the form of "high powered microwave" (HPM) instruments which can be targeted against the guidance and communication systems of aircraft, missiles, or armored vehicles. The HPM can destroy computer circuits and, as a result, disable a wide variety of military equipment. The HERF gun mentioned above fits into this category as do the microwave weapons which can have a disabling impact on individual. At lower levels, microwave weapons, which are sometimes described as "confusion weapons", can have an negative impact on human behavior patterns.[9]

Anti-personnel Nonlethal Weapons

While the more sophisticated and often sinister sounding nonlethals generally attract the most attention, it is the anti-personnel

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[7] David Guyatt, "Killing Me Softly", *Infowar.com*, December 22, 1997

[8] Chris Morris, Janet Morris, and Thomas Baines, "Weapons of Mass Protection: Nonlethality, Information Warfare, and Airpower in the Age of Chaos", *Air Chronicles* Home Page, Maxwell Air Force Base, www.cdsar.af.mil., pp. 8-9.

[9] Ibid., pp. 5-6.

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nonnonlethals which generate the greatest opposition. The dividing line, as is obvious from the discussion above, is not precise but when it is clear that the primary purpose of the instrument is anti-personnel, there is an increasingly critical attitude toward it. One of the most widely discussed of these is information warfare (IW), a term most often used to describe the exploitation of data collection and storage vulnerabilities and a technique which is essentially anti-personnel in its effort to control human perceptions. This concept stresses the achievement of "information dominance" by controlling data received by your adversary and maintaining the information flow necessary for effective decision-making. Successful information warfare insures not only a superior knowledge of order of battle concerns but also the ability to use information to the detriment of an enemy.[10] This interesting concept, something which brings together the traditional as well as the modern, has sparked lively debates about its conceptual placement and its practical utilization. In most current military discussions, the key information warfare question is who will utilize this important and essentially non-lethal resource.[11]

One particularly useful definition of information warfare comes from the study of marketing strategies. Within the context of business, IW is described as a process for achieving and maintaining an information advantage over competitors or adversaries.[12] This simple concept, designed to enhance the marketability of products, has a direct relevance to military operations in which competitive relationships are even more fundamental. Viewed within the military context, information warfare encompasses activities designed to undermine the essential information networks upon which nations rely for performance of governmental, military, or commercial operations.

Closely related to this is one of the most effective weapons used during the Cold War: disinformation. As a reflection of official

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[10] L. Scott Johnson, "Toward a Functional Model of Information Warfare", *Infowar.com*, December, 1996.

[11] Stephen R. Bowers, "Information Warfare", *Armed Forces Journal International*, February, 1998, pp. 30-31.

[12] Dr. Myron L. Cramer, "Information Warfare", *The Information Revolution*, graduate seminar, Georgia Institute of Technology, Atlanta, Georgia, October 31, 1995.

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U.S. concern over disinformation, an office was created in the U.S. Department of State's INR division to deal with disinformation campaigns launched against the United States. One of the most pernicious of such undertakings was the Soviet-inspired report that AIDS was created by the U.S. Department of Defense. This dramatic charge appeared in numerous newspapers outside the Soviet Union during the 1980s and appears to have been part of a concerted Soviet effort to spread stories detrimental to U.S. interests.[13]

Disasters create special opportunities for the employment of disinformation campaigns. Almost every airline crash seems to motivate terrorist groups to claim credit for the event while critics of governmental agencies will point to the incident as evidence of the state's inability to protect citizens. It is as if every criminal act is attributed the numerous different perpetrators. When the Federal building in Oklahoma City was bombed in 1995, there was a flood of claims that the unidentified agencies of the U.S. government had staged the event as a pretext for taking actions against domestic critics. Equally sinister reports have alleged that the plane carrying U.S. Secretary of Commerce Ron Brown on a visit to Croatia was brought down as a result of a complex conspiracy. Even covert operations are affected by technological advances ininformation warfare. A major technique employed by the Central Intelligence Agency in combatting terrorism is the disruption via computer intervention of the international financial activities of supporters of suspected terrorists.[14] IW has been utilized by U.S. and other forces operating in Bosnia and personnel from Fort Bragg's Fourth Psychological Operations Group have been stationed there on a permanent basis since the Dayton agreement was implemented.[15]

As part of a routine effort to develop national power, nations have long emphasized the cultivation of "synthetic" as contrasted with natural sources of power. Military preparedness and industrial capacity, the most frequently cited illustrations of synthetic power, could not be maintained without modern computer systems. These systems, so essential for any modern military power, are made more

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[13] Roy Godson, *Dezinformatzia*, 1985, pp. 23-44.

[14] Walter Pincus, "CIA Turns to Covert Action Against Terrorism...", *The Washington Post*, September 14, 1997, p. A6.

[15]. Alan Campen, "Misuse of Federal Infowar Tools", *Infowar.com*, November 15, 1997.

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vulnerable by the existence of IW as a war-fighting strategy. This strategy is especially important because it can distort the information upon which modern military planners are dependent. By interrupting the flow of data and by distorting vital sensor inputs effective IW can effectively cripple an adversary's forces without engaging them in direct combat. Thirty years ago, relatively simple monitors enabled US forces in Vietnam to detect movements along the enemy's main supply routes and plan air strikes that would prevent the re-supply of the North Vietnamese forces. An effective IW campaign would have concentrated on ways to disrupt the messages provided by those monitors and thus provide US military planners with misleading data. The utilization of obscurants during the Gulf War effectively inhibited the ability of the Iraqi forces to detect U.S. troop movements when the ground war began.

Another widely discussed and less cerebral instance of an anti-personnel non-lethal weapon is electromagnetic pulse or EMP. Experiments with EMP have been recorded as early as World War Two when Japanese researchers apparently attempted to create a "death ray" that could be directed against ground forces from a distance of five to ten miles. The physical impact of such a device, depending on the wave length employed, could include either hemorrhaging of lungs or destruction of brain cells. By 1965, U.S. governmental agencies were actively involved in research on the utilization of low intensity microwaves. Studies prepared for the U.S. Navy indicated that, properly utilized, microwaves could induce heart seizures, cause brain damage, and produce hallucinations.[16] The primary objective of these programs was to determine the feasibility of using microwave signals to influence human perceptions and, ultimately, control human behavior.[17]

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[16] Equally controversial but even more difficult to comprehend is a project said to be sponsored by the Office of Naval Research and the U. S. Air Force. Known as the High Frequency Active Auroral Research Program, this endeavor, according to is numerous critics among the environmental community, will result in a fantastic non-lethal weapon that will have lethal consequences for the entire ionosphere. The debate over this project is symptomatic of the increasing hysteria surrounding efforts to devise unconventional weapons utilizing some of the technological innovations of the past decade.

[17] David Guyatt, "Some Aspects of Antipersonnel Electromagnetic Weapons", Paper prepared for the ICRC Symposium on The Medical Profession and the Effects of Weapons, February, 1996, p. 3.

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It is the anti-personnel nonlethals which are designed to control human behavior that have become the most controversial of the numerous nonlethal weapon systems. At the same time, they are often the ones which seem most valuable to military planners. One aftermath of the disastrous U.S. military operations in Somalia was a renewed military concern for the creation of nonlethal sedatives which could, presumably, be introduced into a nation's food supplies or, as a last resort, be applied by low-flying aircraft. Referred to as "drug-assisted subliminal conditioning", these techniques are attractive to military planners concerned with the prevention of violent confrontations with the local populace and the maintenance of a low-cost military presence.[18]

Most controversial of all the nonlethals are the much discussed "gene specific" biological and toxin weapons. While heated discussions of such devices would indicate that a *Brave New World* of weapons had arrived, it is not certain that these have, in fact, been developed. Yet, the belief that they are in the planning stage generates both enthusiasm and horror at the prospect of being able to deploy a genetic equivalent of the so-called "smart bomb" that would, in effect, target the race seen as most threatening to your national interests. This concept is closely related to the notion of the controversial biological warfare but made even more menacing by fears that an insidious "germ weapon" could single out a specific ethnic or racial group. As the world has grown familiar with atrocities in the wars in the former Yugoslavia, suspicions about this prospect have intensified among those who are already critical of developments in the field of nonlethal weapons.[19]

Nonlethal Weapons & National Security

The evolution of war-fighting capabilities demonstrates a central theme: the struggle to enable a nation to project its power more effectively and more affordably. The goal of this process, simply put, is *to apply its power* in the most efficient manner. Efficiency means that *power* will be more devastating and that the nation will be able to sustain that effort. Weapons that require, not ammunition, but

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[18] Guyatt, "Killing Me Softly", pp. 3-4.
[19] Ibid., pp. 7-8.

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simply a continuing power supply are much more affordable that the traditional weapons utilized in fighting our wars of the past.

Yet, the increased development and introduction of nonlethal weapons into our military arsenal will raise ethical, humanitarian, and even legal questions regarding the guidelines for their use. While it would seem that being able to avoid causing the death of an enemy is a significant humanitarian improvement, many critics argue that the very flexibility that makes that possible also creates a situation in which authorities can employ varying degrees of force in accordance with popular acceptance. Some nonlethals, as seen through critical eyes, are little more than instruments of torture.

It is also important to note that the guidelines for use of such weapons are very different from those which applied to the utilization of conventional weapons. In an earlier era, there were numerous technical problems that had to be overcome before a nation could undertake military actions. Logistical matters such as required mobilization and transportation times served as very real constraints on the deployment of forces. In the nuclear era, the devastating consequences of a nuclear exchange acted as a deterrent to military exchanges. When we discuss the world of nonlethal weapons, these constraints are no longer operative. As a result, the decision to employ nonlethals which may have dramatic consequences can be made much more easily by strategists who feel relatively immune to the restraining pressures faced by their predecessors. Thus, one practical result of the development of nonlethal strategies is that the threshold for warfare has been significantly lowered.

While nonlethal weapons are, correctly, praised for their variable utility, it is this quality that has raised concerns among human rights groups as well as anti-government conspiracy theorists. Both express fears that such weapons could easily be used to suppress legitimate political dissent. As a result, the ability of a government to exercise control without using the sort of force that might cause a popular protest means that the absolute power of the state has increased. Therefore, the development of nonlethal weapons has politically disturbing implications. Many critics voice concern that the presence of such weapons in a governmental arsenal makes it possible to suppress dissent without resorting to the physical excesses that might otherwise make such actions politically unacceptable.

Meanwhile, nonlethal force may well have a dehumanizing

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impact on victims who, while still alive, have suffered horrible injuries that in the past would have been unthinkable. Many of those injuries, unlike the numerous wounds sustained in conventional warfare, are beyond the abilities of medics who might effectively treat a gunshot wound. In particular, the psychological impact of many nonlethal weapon systems may result in traumas which are difficult to detect in the short run and perhaps even impossible to treat in the long run.

Another area of great concern is the potential development of race-specific weapons based on the knowledge of genetic engineering and human genome diversity. This type of weaponry, especially in the hands of the political criminals who seem to have gained power in so much of the world, could lead to an especially sinister form of genocide. It is not too difficult to imagine how such a device could be utilized by a leader like Saddam Hussein determined to destroy a Kurdish ethnic community seen as a threat to his power.

The development of nonlethal weapons which are often less expensive than traditional weapons has created special opportunities for law enforcement officers to employ low-cost instruments with less than deadly force. Yet, the cost and availability of many of these weapons also creates prospects for terrorists and criminals who can use the same weapons against authorities or innocent civilians. While the use of nonlethal weapons could be praised as a more "humanitarian" approach on the battlefield, this development offers modern day terrorists an opportunity to create threatening and disruptive scenarios without devastating loss of life that often served as a deterrent to their utilization. Such groups could claim that their use of nonlethal weapons reflects their intention neither to kill nor permanently injure citizens in fulfilling their political agendas. However, the ambiguity that surrounds the utilization these weapons indicates that we are at a potentially radical break with traditional war fighting and therefore we must devise new strategies to counter their deployment. The unfortunate truth is that our ability to create the new weapons has outpaced our ability to devise the strategies required for responding to the new threats posed by some nonlethals.

Consider the moral quandary of strategists in the era of nonlethal weapons. If the nonlethal approach is more politically acceptable, then nonlethal employment by terrorists must be more acceptable for professed revolutionary causes. Does this give the

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potential terrorist a choice between nonlethal and lethal? Does the duration of impairment redeem the use of a weapon? Or when a calmative agent is used, does it only temporarily calm the victim or can it leave the victim with permanent side effects? Will nonlethal weapons be used in conjunction with conventional weapons and their potential for battlefield dominance be compounded? There are no easy or absolute answers to the many questions raised by the introduction of this new technology.

A final point is that, in spite of the sophistication of our defensive systems, if we lack the resolve or the ability to employ those systems, they do not serve our national interests. In fact, while there was speculation after the end of the Cold War that military power had been greatly diminished in terms of its utility as a political or diplomatic tool, we now find ourselves in a world which demands more rather than less military action. Therefore, the effort to make war more palatable is essential to our national interest because it eases the burden of national leaders attempting to garner public support in a democratic state for the pursuit of national goals through military instruments.

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The Prospects For Space Tourism

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The author argues that the concept of space tourism is rapidly emerging as a practical reality.

Key Words: Space travel, tourism, NASA

Serious discussion of the possibility of space travel by people other than professional astronauts has been underway for the past four decades.

Originally it was thought that our civil space program would undertake activities that would see this possibility realized. And, indeed, we did see one of our Senators, a Congressman and an Arabian prince take a trip to space. In parallel, two private persons, one from the United Kingdom and one from Japan, traveled to/from the Russian space station MIR.

However, the government pace was slow, and in the mid-1980's a few small companies were formed in the United States that began to explore the possibility of creating viable private sector space tourism enterprises.

The tragic Shuttle Challenger disaster of 1986, in which five professional astronauts and the schoolteacher, Christa McAuliffe, were killed, saw all government and private sector space tourism ambitions put aside. Except for the publishing of a few professional papers, activities in this space-related area remained moribund for a half-dozen years.

Then, professional and business interest in space tourism commenced in Japan, and it has continued since. A large number of papers have been written there, an initial vehicle design concept specifically focused upon space tourism operations was arrived at, and a model thereof shown at an international aerospace exhibition.[1]

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[1] "Space Tourism: The Perspective From Japan and Some Implication for the United States"; T. F. Rogers; *The Journal of Practical Applications in Space;* Winter, 1995, Vol VI, Issue No. 2; pages 109-149.

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Market studies made there, and subsequently in the United States and elsewhere, during the past very few years suggest that, when fully developed, space travel and tourism could become a new space-related business with annual revenues of as much as $10 billion per year. Already, 10-12 million people visit our Air and Space Museum, the Kennedy launch site, space camps, etc. – a terrestrial space tourism business probably some $1 billion per year in size.

Nevertheless, the most general view today regarding the prospects of ordinary people taking trips to space continues to be essentially that recently expressed by an "Editorial Observer" in *The New York Times:*

> Children of my generation grew up pinioned between two technological tensions: the patriotic optimism of President Kennedy's manned-space program and fear of nuclear war... [But] with a few stunning exceptions – Alan Shepard's flight, John Glenn's orbit, the moon landing – the optimism evoked by the space program was always being deferred. ...I had hoped, when I was a third grader, to be on Mars by the time I was 24... Now, reflecting upon the results of missions like Cassini and the Hubble Space Telescope...may [have to] be space travel enough for me.[2]

But this view is now expected to change, fundamentally, within the next very few years. For instance:

- In cost-sharing cooperation with our Federal government, the Lockheed-Martin company is developing technology to test the soundness of a new surface-low Earth orbit transportation concept – that of carrying people/cargo in a single-stage-to-orbit (SSTO) fully reusable vehicle, operated very much like today's commercial aircraft. An experimental model of this vehicle, the X-33, is expected to be under test by the end of the decade. If successful, this could lead to the private sector acquisition and operation of vehicles much more safe and reliable than those of the Shuttle fleet, and much less costly to operate;

- A half-dozen private space transportation vehicle development

[2] Verlyn Klinkenborg; October 16, 1997; page A34 – the editorial page.

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companies have been formed in the United States – companies that expect to produce and operate smaller vehicles than the presently envisioned X-33 follow-on, but all privately financed. At least one of these companies expects, within 4-5 years, to be able to carry people to an altitude 10 times higher than that reached by the highest-flying commercial aircraft; and

- A Space Act Agreement concerning space tourism is being conducted cooperatively by the National Aeronautics and Space Administration (NASA) and the Space Transportation Association (STA). It has been underway for two years and has involved scores of professional and business people who have been addressing the question "What should the United States do to see a potentially large space tourism business come into being?" It is expected to be reported upon publicly early this year, and its conclusions are expected to be encouraging.

A growing number of those in the space community's human space flight area are now beginning to think that, at last, the prospects for space tourism are approaching reality.

For example, the President of the International Astronautical Federation has recently observed that:

> I also see a desire for space tourism that could spur the development of space transportation systems in much the same way that modern fleets of transport aircraft were spurred by the tourist and business traveler.[3]

Inasmuch as the bulk of the people who are now involved in space tourism-related activities are from the space community, their expressed judgments must be judged with some reserve. Now, however, two things have taken place that suggest, strongly and objectively, that today's space tourism interests are on the right track.

- Two U.S. private sector companies have recently announced their intention to offer additional and novel space trips to the

[3] "Space, 40 Years After Sputnik – The space cadets grow up"; October 4-10, 1997; pages 85-87.

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general public. These are: Space Adventures, Fairfax, Virginia; and Zegrahm Expeditions Inc., Seattle, Washington.

Trips are being planned to reach altitudes of up to some 100 kilometers where extraordinary sightings of the Earth and the cosmos can be made. All of these trips are expected to become available in four to five years. And tourist trips all the way to orbit are also being actively considered.

The organizations that are developing vehicles that would make these very high altitude and in-orbit trips possible are teaming with successful travel and tourism companies whose marketing resources and experience will be of great value to the space vehicle providers-operators.

• The views in the "media" world regarding space tourism are finally changing. For instance, in a story noted on its cover, *The Economist* magazine recently generally deplored the history of human space flight:

> The upshot of all this vision and money has been to launch space technology on what was probably the wrong path...for what was undoubtedly the wrong reason – putting people in orbit with a view to transporting them to other worlds. A more measured approach, with commercial goals foremost, would have concentrated from the beginning on cheapening the process of getting into orbit.

But the story concludes with the upbeat observation that:

> Ironically, if safety can be significantly improved, *the main commercial market for manned space-flight may be...tourism*. ...A surprising number of people might be willing to pay [a large sum] in order to take the ultimate in holiday snapshots. It ... would be real – and it would be a start. (Italics added.)

The Economist is a magazine of wide international circulation and considerable economic and business repute. For it to make such an observation suggests that "space tourism" business credibility is gradually beginning to be widely established.

It is always difficult to estimate how soon new technology will

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be introduced to and widely accepted by the general public. But if there are no more fatal Shuttle accidents, if the economy remains reasonably strong, and if even one or two of the vehicle development and surface tourism business efforts now underway bear fruit, the first decade of the next century could see general public space travel and tourism finally begin to become a reality.

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The Future of the Gulf

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Iraq After Saddam – What Lies Ahead?

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Since the Iraqi invasion and occupation of Kuwait in August 1990 the world's attention has focused on President Saddam Hussein. His continuous challenge to the international community and the United Nations resolutions has made many leaders in the region and the rest of the world believe that his removal from power would bring peace and stability to the Persian Gulf. This study argues that in addition to the choices the Iraqi leadership made, other geopolitical characteristics have influenced the country's political orientation for the last several decades and are likely to have an important impact on its future. These include: demographic structure, fresh water resources, oil shipment, and border disputes. The study concludes that the next regime in Baghdad, when it comes, is likely to be less ruthless but still not democratic.

Key Words: Middle East; Iraq, Saddam Hussein; Iraq, future of; Iraq, demographics; Iraq, oil; Iraq, water, Iraq, Border disputes

For several decades oil has been the world's main source of energy. Other sources such as coal, natural gas, nuclear power, and renewable resources (hydroelectricity, geothermal, solar, and wind) contribute to world energy consumption but at lower level than oil. According to the United States Department of Energy, in 1996 the share of oil in world energy consumption was 39 percent.[1] In 1995 the share of the Persian Gulf in world consumption was 26.4 percent and is projected to reach 41.5 percent by the year 2015.[2] In other words, in the closing years of the 20th century the world is dependent on the oil supply from the Gulf and over the next few decades this dependency is expected to deepen. No wonder the stability of the region is of significant concern to all global powers.

The Gulf War demonstrated the international community's determination to defend oil supplies from the region. The interna-

[1] US Department of Energy, Energy Information Administration, International Energy Outlook 1997, Washington DC, US Government Printing Office, 1997, p.2.
[2] Ibid, p.161.

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tional coalition, led by the United States, dealt a heavy blow, but not a fatal one, to the Iraqi army. Since then, several countries have accused Iraqi President Saddam Hussein of using whatever was left of his military power to de-stabilize the region. Washington, London, Riyadh, Kuwait, and many other states do not hide their mistrust of the Iraqi leader. Many policy-makers all over the world believe that there will not be stability in the Gulf region as long as Saddam Hussein is in power. As an illustration of this belief, the Central Intelligence Agency (CIA) spent more than $100 million on a covert program to oust the Iraqi leader.[3] In short, increasingly the situation in the Persian Gulf has been portrayed as "Saddam Hussein against the world."

This study adopts a cautious approach toward this perception. There is no doubt that the Iraqi leader made a number of miscalculations which have had disastrous consequences to his country. According to a prominent scholar of the region, "this man alone is responsible for hundreds of thousands of deaths, untold suffering, and a setback to his country's economic prospects that will take decades to repair.[4]" It is ironic that in Iraq, the country with the second largest oil reserves in the world after Saudi Arabia, people have suffered from intolerable economic conditions for the last several years. The Iraqi leader bears the responsibility for much of this suffering.

At the same time, it is important not to over-emphasize Saddam Hussein's role and not to underestimate the impact of other factors on Baghdad's policy. Before Saddam rose to power in the 1970s, Iraq was not a liberal democracy. At one point, he will leave eventually the scene and will not be succeeded by an Iraqi Thomas Jefferson. Rather, another less authoritarian leader is likely to take his place. In other words, before Saddam and after him important socioeconomic characteristics have continued to shape the Iraqi policy. In the following an attempt is made to analyze these characteristics and how they might influence the choices available for any future leadership in Baghdad. First, the demographic structure of the Iraqi population will be discussed. Baghdad's dependency on its neighbors to export oil and to receive water will be examined in the following sections.

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[3] Elaine Sciolino, "A Shift to Diplomacy and Coexistence," *New York Times*, November 21, 1997, P.A16.

[4] William Quandt, "The Middle East on the Brink: Prospects for Change in the 21st Century," *Middle East Journal*, Vol.50, No.1, Winter 1996, p.13.

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Finally, the border disputes in the region will be reviewed.

The Demographic Structure

The Iraqi population is composed of different ethnic (Arab 75%-80%, Kurdish 15%-20%, Turkoman, Assyrian, and others 5%) and sectarian (Shi'is 60%-65%, Sunnis 32%-37%, Christians and others 3%) groups.[5] For a long time both the Kurds and the Shi'is have been active in resisting the central authority of the Arab-Sunni government in Baghdad. The Shi'is can be seen as a "subordinate majority" (i.e., numerically, they are the largest sectarian group but they are not in power), and the Kurds are considered a "significant minority.[6]" While the Shi'is are a sectarian group and the Kurds are an ethnic one, both of them share the perception that they have different traits from the rest of the population such as history, culture, language, political aspirations, and religious practices. Like any other sectarian or ethnic group, the Shi'is and the Kurds aim at overcoming all kinds of discrimination directed against them. However, they differ on their final objective, and the response they have received from both the international community and the government in Baghdad.

In spite of the Shi'is numerical advantage, they have never enjoyed economic benefits and political rights equal to their Arab Sunni counterparts who have dominated the political system in Iraq since its independence from Britain in 1932. Leaving aside a small number of wealthy business executive and professionals, most Iraqi Shi'is form an impoverished underclass in Baghdad and southern Iraq.[7] Their conditions have further deteriorated since the collapse of the monarchy in 1958 and particularly since the Baath party returned to power in 1968. The Gulf War and its aftermath were perceived by some Shi'is as a "window of opportunity" to acquire a bigger share of the political power in Baghdad. Accordingly, only a

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[5] Central Intelligence Agency, The World Factbook 1996, Washington DC: US Government Printing Office, 1997, p.204.

[6] These two terms "subordinate majority" and "significant minority" are borrowed from Ted Robert Gurr, *Minorities at Risk: A Global View of Ethnopolitical Conflicts,* Washington DC: United States Institute of Peace Press, 1993.

[7] Andrew Whitley, "Minorities and the Stateless in Persian Gulf Politics," *Survival,* Vol.35, No.4, Winter 1993, p.36.

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few weeks after the end of the fighting, a Shi'i rebellion in the south started. In about two weeks, troops loyal to the government were able to crush the revolt. Since then, the Shi'i resistance has been on the wane mainly due to the regime's brutality. A recent episode took place in the Marshlands of southern Iraq. About half a million residents, mostly Shi'i, have had their own distinguished civilization for thousands of years. In 1992, the government embarked on a large-scale project to drain and divert water from the region and, in the process, destroyed this ancient civilization. Allegations were made that the Iraqi regime used chemical weapons and poisoned the water to force the residents out of the region.[8] In October 1996, the government announced the completion of this huge project.[9]

Another reason for the fading of the Shi'i resistance can be found in the relative lack of international interest in the Shi'i community. The close link between the Iraqi Shi'is and their co-religionists in Iran has prompted the suspicion of regional and international powers. Simply stated, the latter do not want to see Tehran's influence expand further to southern Iraq. Meanwhile, since the early 1990s, the international community has shown different kinds of interest and protection of the other major group – the Kurds.

The Kurds are the largest ethnic group in the Middle East without an independent state to represent them. An historical opportunity to establish a Kurdish state was sanctioned in the Treaty of Sevres in 1920. However, this part of the treaty was never implemented. Rather, under completely different circumstances a Kurdish state was created in 1945 but lasted for only few months. Nevertheless, Kurdish aspirations were not diminished. The Kurds have continued to pursue both diplomatic and violent methods to achieve their goal of independence and self-rule. Their struggle has particularly intensified since the late 1950s. The rise to power of subsequent nationalist and Baathist governments in Baghdad did not favor Kurdish aspirations. Thus, for several decades the relations between the Kurds and the central authority in Baghdad can be described as a series of uprisings and fragile peace. In 1970 after several rounds of fighting and negotiation, the Kurdish leaders

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[8] International Institute for Strategic Studies, Strategic Survey, London: Brassey's, 1994, p.140.

[9] *Middle East Economic Digest*, "Iraq: An Ambitious Scheme in an Afflicted Land," Vol.40, No.43, October 25, 1996, p.26.

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reached an agreement with the Iraqi government under which they would have been allowed to speak their own language and participate in the government. Equally important, the agreement recognized the bi-nationalist characteristic of the Iraqi state.[10] After four years of reluctance and delay, the agreement was never fully implemented and the fighting between the government and the Kurds resumed.

A peak in the campaign against the Kurds was reached in March 1988 when the government used chemical weapons in Halabja and thousands of Kurds were killed.[11] Another tragic episode took place shortly after the Gulf War. Like the Shi'is, the Kurds rebelled against the regime in Baghdad and received the same response – brutal repression. This incited Western leaders to create a "safe-haven" zone in northern Iraq to protect the Kurds. In most of the 1990s, this zone has witnessed several military clashes between the two major Kurdish Parties The Kurdish Democratic Party (KDP) and the Patriotic Union of Kurdistan (PUK). The government in Baghdad did not hesitate to take advantage of this intra-Kurdish fighting by playing off one faction against the other.

Finally, it is important to point out that the objective of the Western powers is not clear. On the one side, they obligated themselves to defend the Kurds from the ruthlessness of Saddam Hussein. On the other, they do not support an independent Kurdish state for fear of antagonizing Turkey, a NATO member, which has its own Kurdish problem. Given all these local, regional, and international dynamics, the situation in the Kurdistan region in northern Iraq can be described as an anarchy.

Three intertwined conclusions can be drawn from the foregoing discussion. First, the dilemma of assimilating the sectarian and ethnic communities has confronted the central authorities in Baghdad for a long time. A common approach has been using coercive methods to force members in the two communities to accept a national identity. No genuine attempt was made to accommodate their demands. Second, under Saddam Hussein's leadership the violence against the

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[10] Oman Sheikhmous, "The Kurdish Question: Conflict Resolution Strategies at the Regional Level," in Elise Boulding, (ed), *Building Peace in the Middle East*, Boulder, CO: Lynne Rienner, 1994, p.153.

[11] *Middle East Watch*, Human Rights in Iraq, New York: Human Rights Watch, 1990, p.144.

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Shi'is and the Kurds reached an unprecedented level. The government's actions in the Marshlands, Halabja, and the rebellions of 1991 are good illustrations. Third, the questions of the Shi'is and the Kurds are still unanswered. No solution has been found. A forced assimilation can not guarantee long-term domestic stability. This issue is likely to haunt any future leadership in Baghdad until a satisfactory political solution, not a security one, is found. This unresolved domestic dilemma is aggravated by strong dependency on neighboring countries in receiving water and exporting oil

Water Vulnerability

Unlike its Arab neighbors Iraq does not suffer from a water-shortage. Rather, Baghdad has a variety of resources to satisfy its needs including an average annual rainfall of about 800 mm ranging from less than 150 mm in the south-western desert to over 1,892 mm in the mountains of the north-east;[12] two important rivers: Euphrates and Tigris; and aquifers. Still, Iraq faces a water-problem of a different magnitude and different kind. Its most important resources, the Euphrates and the Tigris rivers, originate mainly from outside its borders. Approximately 98% of the Euphrates originates in the mountains of eastern Anatolia and about 50% of the Tigris rises from there as well. Other tributaries to the Tigris are located in Iraq with their headwaters in Iran, including the Greater and Lesser Zab, the Adheim, and the Diyala rivers.[13] Meanwhile 40% of the Euphrates lies in Turkey, 25% in Syria, and 35% in Iraq, and 20% of the Tigris lies in Turkey, 78% in Iraq, and only 2% in the northeastern corner of Syria.[14] This leaves Baghdad dependent on and vulnerable to its neighbors: Turkey and Syria on the Euphrates, and Turkey and Iran on the Tigris. Over the years, this dependency has deepened Iraq's sense of national vulnerability and contributed to its feeling of insecurity.

A close examination of the Iraqi water resources justifies this fear. First, as the most down-stream riparian on the Euphrates, Baghdad has been at the mercy of both Syria and Turkey. Furthermore, Iraq's water-demands have often collided with those of Syria and Turkey. The latter has tremendous leverage over the basin and

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[12] Natasha Beschorner, *Water and Instability in the Middle East*, London: Brassey's, 1993, p.34.

[13] Ibid, p.29.

[14] Daniel Hillel, *Rivers of Eden*, New York: Oxford University Press, 1994, p.92.

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has not shown any hesitation in taking full advantage of its strong position as the upstream riparian. Second, in contrast to the Euphrates, a smaller part of the Tigris rises from outside Iraq. However, the fact that Iraq is less vulnerable to external control over the Tigris should not be taken as comfort to the government in Baghdad. Most of the Tigris's tributaries in Iraq are located in the north eastern part of the country where the majority of the population are Kurds. Given the unstable conditions there over the last few decades, it is apparent that water from the Tigris cannot be taken for granted either. Third, since water supplies from the twin rivers are threatened, one by both Syria and Turkey, and the other by the Kurds, other resources have to be considered. However, Iraq's groundwater resources are limited and underdeveloped. These supplies cannot make up for any loss of water from the two rivers. Moreover, Iraq is almost a landlocked state with a very narrow outlet on the Gulf, which means that the availability of water from there for desalination is very limited.

Given these characteristics of Baghdad's water resources, there have been several water-related disputes with Syria and Turkey. In late 1974 the tension between Baghdad and Damascus escalated when the former massed its troops close to the borders with the latter and threatened to bomb the Al Thawra Dam, which was reducing the flow of the Euphrates to Iraq. The confrontation ended peacefully thanks to Soviet and Saudi mediations. Meanwhile, Iraq's and Syria's mutual concern over a sufficient and uninterrupted flow of the Euphrates from the upstream riparian, Turkey, has modified their suspicion of each other and provided a common ground where the interests of the two countries coincide. Thus, when Turkey announced in November 1989 that it would stop the flow of the Euphrates for a month (which it did from mid January to mid February 1990) in order to fill the reservoir behind the newly-built Ataturk Dam, delegations from Syria and Iraq met and agreed that the former would allow the latter 58 percent of the flow of the Euphrates at the Turkish-Syrian border.[15] By the second half of the 1990s, Damascus and Baghdad have tried unsuccessfully to coordinate their efforts to block international financing to the Birecik Dam and other Turkish projects on the

[15] Greg Shapland, "Water and Politics in the Middle East," in M. Jane Davis, (ed), *Politics and International Relations in the Middle East*, Aldershot, UK: Edward Elgar, 1995, p.81.

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Euphrates.

Turkey has always denied any legal obligation to provide water to the downstream riparians. Ankara has always emphasized its adherence to the principle of "absolute territorial sovereignty" which gives it unlimited authority to do whatever it perceives appropriate within its borders. Baghdad, on the other side, adheres to the principle of "absolute integrity of a river basin" which limits the right of a unilateral action by an individual riparian and, instead, requests a coordination between all the states which share the basin.[16] The two principles are well-integrated in the body of the international law. But, Turkey's status as the upstream riparian and its military might (due to its membership in NATO and the Iraqi defeat in the Gulf War) have given Ankara a free hand to implement a number of huge projects on both the Euphrates and the Tigris, which certainly will reduce the flow of the two rivers and will increase their pollution.[17]

These troubled relations between Iraq and its two neighbors with whom it shares most of its two rivers raise questions about the reliability of these resources at present and in the near future. It is worth noting that the three riparian states have failed for several decades to reach an agreement on regulating and sharing the two rivers. In the early 1980s, they created a Technical Committee which lacked any real power and did not improve the chances for cooperation among the three countries. To sum up, the characteristics of water resources have deepened Iraq's dependency on its neighbors and intensified its sense of vulnerability. This geopolitical configuration is likely to persist regardless of who is in power in Baghdad. This conclusion can be equally applied to the country's major source of revenue – oil.

Oil Pipelines

Originally, oil was discovered in Iraq in 1923 by the Khanaqin Oil Company.[18] In 1927 a major discovery was made in Kirkuk. Since then, oil fields there have become the main source of Iraqi

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[16] For a discussion of the two theories see Hasan Chalabi and Tarek Majzoub, "Turkey, the waters of the Euphrates and Public International Law," in J.A. Allan and Chibli Mallat, (eds), *Water in the Middle East*, London: I.B.Tauris, 1995, pp.226-228.

[17] The most well-publicized of these projects is the Great Anatolia Project (GAP).

[18] For a detailed historical review of oil discoveries in Iraq see John Marlowe, *The Persian Gulf in the Twentieth Century*, New York: Frederick A. Praeger, 1962, particularly chapter 5, pp.78-98.

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production.[19] At the end of the twentieth century, Iraq holds 10.8 percent of world proven oil reserves, second only to Saudi Arabia.[20] However, the huge Iraqi oil resources cannot be fully utilized without access to the international market. This is exactly where the dilemma lies.

Unlike the other Gulf states, Iraq is almost a landlocked state with a very small maritime outlet. Given this geopolitical characteristic, Baghdad created an extensive system of oil shipment. Shortly after the creation of Iraq as a nation-state in the aftermath of the First World War, the British and French authorities, then in charge of most of the region, constructed pipelines linking Iraqi oil fields with terminals on the Mediterranean in Haifa, Tripoli, and Banias (in Israel, Lebanon, and Syria respectively.) Similarly, the subsequent Iraqi governments since the late 1970s have engaged in many projects to enlarge the country's safety network of pipelines. In 1977 a pipeline linking the northern oil fields in Kirkuk to the Turkish port Dortyol on the Mediterranean came into operation, and in 1987 a parallel line was added. In addition to these lines to Turkey, another major pipeline was constructed through Kuwait and across Saudi Arabia to Yonbu on the Red Sea coast in 1985 and was supplemented with another one in 1990.[21]

These comprehensive and well-developed networks of pipelines show how dependent Baghdad is on the goodwill of its neighbors. Over the last few decades Iraq's vulnerability has been demonstrated one time after another. The establishment of Israel in 1948 was an important reason for the closure of the Haifa line. The civil war in Lebanon and the antagonism between the two Baath regimes in Damascus and Baghdad were the main reasons for the closure of the Tripoli and Banias outlets. The Gulf War immobilized the pipelines across Turkey and Saudi Arabia and brought the shipping of the Iraqi oil to a halt. Once the United Nations sanctions are completely lifted, Baghdad will reactivate its pipelines, which will take some time in

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[19] Keith McLachlan, "Oil in the Persian Gulf Area," p. 201 in Alvin J. Cottrell, (ed), *The Persian Gulf States*, Baltimore: The Johns Hopkins University Press, 1980.

[20] British Petroleum Company, *BP Statistical Review of World Energy*, London: British Petroleum Company, 1997, p.4.

[21] Economist Intelligence Unit, Country Report: Iraq, London: Economist Intelligence Unit, 1996, p.23.

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order to renegotiate the transit fees and to do the necessary repairs.[22] Still, in order to be able to export its oil and to fully utilize its pipelines, Baghdad needs to develop a "working relationship" with its neighbors. For the last several decades, these relations have mirrored regional tension over another interrelated issue: border disputes.

Border Disputes

Modern day Iraq was created as a nation-state by Britain shortly after the end of the First World War. For hundreds of years Baghdad, Basra, and Mosul (the largest Iraqi cities) were parts of the Ottoman Empire. In the early 1920s, they were united under the British mandate, which lasted until 1932 when Iraq became an independent state. Iraq shares a total of 3,631 km land boundaries with six countries (Iran, Saudi Arabia, Syria, Turkey, Kuwait, and Jordan) and has only 58 km of coastline.[23] This geopolitical configuration puts Baghdad in a disadvantaged status in comparison with its neighbors. Since the late 1930s, successive regimes in Baghdad have tried to overcome this geographical disadvantage. The result has been an almost uninterrupted state of hostility with its neighbors, particularly Iran and Kuwait.

A major source of conflict between Baghdad and Tehran has been the longstanding dispute over the Shatt al-Arab waterway, which runs into the Persian Gulf in the southern border area between the two countries. After several incidents in the early 1930s, the two countries tried to solve their dispute before the League of Nations. This attempt did not succeed, but the two sides negotiated and signed an agreement in 1937 which gave Iraq more control over the waterway.[24] Three decades later, in 1969, Iran abrogated the treaty. Given the military balance of power in the late 1960s between the two countries, Baghdad was not in a position to challenge Tehran. Furthermore, the strong support the Shah granted to the Kurdish rebels fighting the Iraqi government prompted the latter to accept the Iranian claims which were formalized in the Algiers Treaty of 1975.

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[22] Since December 1996 Iraq has been allowed to sell a small proportion of its oil through the pipeline with Turkey.

[23] Central Intelligence Agency, p.204.

[24] Richard N. Schofield, "The Historical Problem of Iraqi Access to the Persian Gulf," in Clive H. Schofield and Richard N. Schofield, (eds), *The Middle East and North Africa*: World Boundaries, London: Routledge, 1994, p.160.

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At the end of the decade, the collapse of the Pahlavi regime and the establishment of the Islamic Republic resulted in domestic turmoil. In an attempt to take advantage of this situation, Saddam Hussein abrogated the Algiers Treaty and started the eight-year war between the two countries. In 1988 the war ended with Iraqi in full control of Shatt al-Arab. However, when planning for the invasion of Kuwait and preparing for the war against the international alliance led by the United States, the Iraqi president made significant concessions to Iran and agreed to share sovereignty over the waterway. The Gulf War and its aftermath shifted the attention from the Iran-Iraq conflict over Shatt al-Arab to the territorial dispute between Baghdad and Kuwait.

The border conflict between the two countries started several decades ago. A landmark agreement was reached in 1932 when Sheikh Ahmad al-Sabah, the ruler of Kuwait, and Nuri al-Said, the Iraqi Prime Minister, exchanged letters which reaffirmed the existing frontier between their two countries.[25] However, this agreement was not honored by the successive regimes in Baghdad. For example, in 1955 the Iraqi government sought to advance its frontier at the expense of Kuwait.[26] The opportunity came in 1961 when the latter became an independent state. The Iraqi Prime Minister General Kassem laid claim to all of Kuwait. A military confrontation almost took place but was averted when British and Arab forces were sent to protect Kuwait.

President Aref's rise to power in Baghdad in 1963 brought a relative ease of the tension between the two countries. The new leader confirmed his adherence to the 1932 agreement and to the sovereignty of Kuwait. Nevertheless, Baghdad renewed its claims over parts of Kuwait particularly the islands of Warba and Bubiyan on the Persian Gulf. Another military Iraqi attack against its southern neighbor was aborted in 1973 due to extensive Arab pressure. The Iran-Iraq war reinforced Baghdad's demands to acquire access to the islands of Warba and Bubiyan for military purposes. The two islands

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[25] John Allcock, Guy Arnold, Alan Day, D. Lewis, Lorimer Poultney, Roland Rance, and D. Sagar, *Border and Territorial Disputes*, London: Longman, 1992, p.386.

[26] Richard Schofield, "The Kuwaiti Islands of Warbah and Bubiyan, and Iraqi Access to the Gulf," in Richard Schofield, (ed), *Territorial Foundations of the Gulf States*, London: University College London, 1994, p.166.

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would have given Iraq a great strategic advantage against its adversary – Iran. Consequently, Tehran threatened to attack Kuwait if it agreed to cede or lease them. In response, no change occurred and the two islands remained under full Kuwaiti sovereignty.

In the aftermath of the Iran-Iraq war Baghdad intensified its claims over Kuwait and finally Saddam Hussein reached the wrong conclusion that the time was ripe to completely annex Kuwait. After the Gulf War, the United Nations created a commission to demarcate the boundaries between the two countries. Not surprisingly, the result of the UN commission's finding was to redraw the frontier in favor of Kuwait. Given the Iraqi defeat in the Gulf War and under pressure from Russia and France, the government in Baghdad recognized the sovereignty and frontiers of Kuwait in November 1994.

Several interrelated conclusions can be drawn from the preceding discussion. First, at the end of the twentieth century, the border disputes between Iraq and its neighbors should be seen as dormant not settled. The currently weakened and isolated Iraq has a limited power to challenge the status quo. But, one can speculate, if Baghdad were allowed to regain its military power and/or if the international community were unable or unwilling to maintain the sanctions, there is no doubt that Iraq would be likely to challenge what it perceives to be its geopolitical disadvantage, as it had done in the past. Second, since its independence in 1932, the Iraqi leaders have expressed dissatisfaction with the geographical configuration of their country. They have alleged that these frontiers were deliberately drawn by the British to ensure the weakness and vulnerability of Iraq, particularly in regard to access to the Gulf.[27] However, under Saddam Hussein's leadership, Iraq's border disputes with its neighbors were taken to the extreme. Baghdad quarreled with Tehran, Kuwait, and others for several decades over frontiers and other issues. But it was only in 1980 and 1990/91 (under Hussein's leadership) that these quarrels evolved into full-scale, devastating wars. Thus, while a change in the leadership in Baghdad might ease the tension, it would be unlikely to solve the problem. A durable and stable peace among the regional powers in the Persian Gulf region will be established only when Iraq reconciles itself to its disadvantageous position at the head of the Gulf. It is uncertain when this might happen – if ever.

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[27] Charles Tripp, "The Future of Iraq and of Regional Security," in Geoffrey Kemp and Janice Gross Stein, (eds), *Powder Keg in the Middle East*, Lanham, MA: Rowman and Littlefield, 1995, p.149.

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Iraq after Saddam: Concluding Remarks

Since Iraq's invasion of Kuwait in August 1990 a lot has been said and written on the "re-structuring" of the political system in Baghdad. There has been a great deal of disagreement, but almost a universal consensus has been reached on two points which together represent a paradox for policy-makers. First, Saddam Hussein is untrustworthy and unpredictable. His long reign in Iraq has resulted in economic destruction and political instability both in Iraq and in the Persian Gulf region. Second, there is no valid option to replace him. All power contenders lack national popular appeal and are divided on ethnic, religious, and ideological lines. The possible triumph of some of them might endanger the territorial integrity of Iraq, which is seen as a sacred cow by the regional and international powers. These two paradoxical arguments have brought the process of restructuring the political system in Baghdad to a halt. Former American President George Bush said that he and others felt that a sound military defeat would lead to the Iraqi leader's downfall and rightly admitted that he "underestimated the political staying power of President Saddam Hussein."[28] Hardly anybody would have thought that the Iraqi leader would politically survive the defeat and remain in power several years after the war. Still, his political and physical survival can not be taken for granted. Other forces might have an opportunity to replace him. Given the volatility of the Iraqi political system, it is very risky to make any prediction. Still, it is safe to state that over the next several years the regime in Baghdad might evolve into one of the following two directions.

First, the continuation of the current regime. Saddam Hussein is a great survivor. Very few leaders in the world have ever been able to survive two wars. Saddam Hussein initiated both of them and the outcome had been disastrous in terms of human casualty and economic destruction. In the Gulf war he stood against almost the whole world and managed to outlive, politically, most of his rivals both inside and outside Iraq. Moreover, Saddam Hussein has been in power in Baghdad longer than any other leader in its modern history. He has been considered the strong man in Iraq since 1973 and upon

[28] *New York Times*, "Bush Says He Erred in Assuming Hussein Would Fall After War," January 15, 1996, p. A4.

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officially taking over the presidency in 1979, he began the most durable reign the country has experienced for hundreds of years. Furthermore, it is possible that the current regime, under heavy surveillance by the international community, would remain in power for a number of years. It is also possible that Saddam Hussein would be overthrown.

Second, another Sunni, Baathist, and military leader could gain power. Given the structure of the Iraqi political system and the dominant role and heavy control of the Sunnis, the Baathists, and the army on almost all sources of power within the country, it is likely that any alternative leadership to the present one will come from these three constituencies. This potential regime, if it comes to power, will have at least two advantages. Like the current one, it will maintain the territorial integrity of Iraq, but unlike Saddam, the new leader will be more accepted by the regional and international powers.

Regardless of who is in charge in Baghdad, the country's demographic structure and its vulnerability to the goodwill of its neighbors will shape the political orientation of the leadership. Saddam's successor, when he comes, is likely to be less ruthless, but not a Thomas Jefferson.

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Trade Unions and Party Politics in Israel: A Decline of Party Identification

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Trends in the 1994 Israeli elections are examined with special reference to factors which influence electoral decisions, and an explanation is presented for the decline of Histradut voting power.

Key Words: Israel, Israeli political parties. Histadrut, party identification.

In May 1994, the Labor party had lost, for the first time, its control of the Histadrut – the root organization of the Israeli trade unions – which it had dominated over 74 years.

The 1994 election campaign was meant to be a natural sequel to the way things were up to that point. But reality proved to be different. Up to that election campaign, the Labor party – one of the two major parties in Israel and a dominant party for many years – held the absolute majority votes of the Histadrut, at times as high as 75% of the votes. But in 1994, the Labor party shifted, from the majority to the minority, while it achieved merely 33% of the votes.

The year 1994 will be remembered as a significant time of shock to the Histadrut. The voter's verdict has subsequently caused an essential change in the power relations within the Israeli economy. The Histadrut, which functioned not only as a trade union, but as a social movement controlling selected sectors of the Israeli economy – such as settlements, consumerism, finance, health, education and welfare – shrank to a union that represents workers.

In this study we will analyze the issue of the decline in traditional status of the party in the Histadrut organization and in so doing, the weakening of the political parties apparatus and the decline of solidarity with the party by its voters on the one hand, and the rising of the personal dimension of candidates on the other hand. The main question on the agenda in this particular research is: how was this drastic change in the Histadrut possible? The answer lies in several factors: the decline in the importance of party identification, the absence of foreign affairs and security topics together with the right combination of the personal dimension of a new candidate,

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Chaim Ramon, young and energetic, regarded sympathetically by the press, with an easy-to-understand election issue – the promise to oppose political corruption, to reform the ill-managed apparatus, and to promote a transition to personal politics.

Our research focuses, therefore, on the transition from old politics based on the party apparatus, whereby political power was founded on ideology and ideological messages constituted the linkage between voters and candidates, into a new and more popular approach to politics in which political actors were more independent and communicated with the public through the mass media and not necessarily through the party.

General Background

The political structure of Israel, as a democracy with many focal points of power, makes it difficult to achieve a consensus on many issues, including the economic. In addition, focal points of power in the Israeli society are independent of each other in perceptions, issues and ways of action. Therefore, they are not necessarily guided by competitive market relations of loss and gain alone, but mainly by moral value considerations, bureaucracy, organizations and trade unions. One of the focal points of power in the Israeli society is the Histadrut.

The Histadrut is a unique phenomenon among worker's organizations in the Western world. Whereas in all other countries the establishment of the state preceded the foundation of its trade unions, which then had to struggle for generations to become effectively organized, in Israel the process was reversed; it was established in 1920, 28 years prior to the state's establishment. Not only that, but workers' political parties existed even before the foundation of the Histadrut, which was essentially the creative product of the incipient state's political parties. Moreover, the Histadrut was an ideological movement and also a trade union with the additional idea of actually building up a homeland for the Jewish people.

With the establishment of Israel in 1948, and with full sovereignty, unfortunately the Histadrut began to decline. It was no longer the focal point of social, economic, security and political activities, as it had been prior to the establishment of the State. National bodies took over, almost completely, many of its important

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functions, such as the labor exchange, education and social benefits, while the entire matter of foreign relations and military security was completely removed from its agenda.

Between 1948 and 1977, the governments' political positions were derived from the same ideological stream as the Histadrut's - that of the Labor Movement. However, through the next seven years, the Histadrut had to contend with a government, the Likud government, based on very different, antithetical, ideological principles, and the nature of the relations between these two centers of power underwent a gradual change.[1] This period ended on 1984, with the establishment of the National Unity Government partnered by the Likud and the Labor party.

Between 1984 and 1990, Israel was administrated by National Unity Governments and in 1992, the Labor party regained power. During that period, between mid-1990 and mid-1992, the Likud (the second party in size up to 1977, and the ruling party in most of the period ever since) ruled again for a short time. On May 10, 1994, the elections for Histadrut took place and resulted in an essential change in the power relation within the Histadrut and the Israeli economy. For the first time, after 74 years, the Labor party had lost its majority, and a new list, Ram, among whose members were three Knesset Members of the Labor party under the leadership of Chaim Ramon, joined with two other parties, Meretz (a left wing front) and N~has (an ultra-religious Oriental party), won the elections. Before we analyze the campaign, a few remarks on the most important variable that explains the electoral upheaval of 1994 – party identification – have to be made.

Party Identification in Israel

Party identification, the most determining factor according to the Michigan School, was found since the late sixties as very influential among Israeli voters. In three national surveys conducted by Arian concerning the 1969 Knesset elections, the percentage of

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[1] About this term see: S.Tzabag, *The Confrontation of Powers: Histadrut and Likud Governments Relationship 1977 - 1984*, Tel Aviv, Hakibutz Hameuchad, 1995. (Hebrew), S.Tzabag, "Co-operation in the Shadow of a Power Struggle: The Likud Governments and the Histadrut, 1977-1984", *Middle Eastern Studies*, Vol 31, No. 4 (October 1995), pp. 849-888.

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those who reported that party identification was the most determining factor on their electoral decision was 16% in the first one, 17% in the second one and the 21% in third one.[2] The other factors were the platform (the ideological factor), candidates evaluation (the personal factor) and supporting an opposition or governing party. In spite of the fact that more respondents reported on the personal factor as the most influential one, Arian concluded that this factor is much weaker than the factor of party identification.[3] The reason for this contradiction may lie in a methodological problem. The survey reflects the comments of the respondents rather than the real motivation for their decision. Respondents in public opinion surveys may tend to avoid exposing their emotional motivation – such as party identification – preferring to emphasize rational thinking. Arian added that over time the weight of the party label is declining, while the weight of the candidate factor is extending.[4]

Caspi and Levinsohn found that the rates of those who reported on party identification as the most determining factor were 26% in 1977, 31% in 1981, 32% in 1984 and 24% and 25% in 1988.[5] Goldberg found in 1992 that 22.3% reported on party identification as the prime determining factor.[6] Comparing the findings of the third survey of 1969 (21%) and that of 1992 (22.3%) could have led to a conclusion that party identification has not been changed over the years.

Nevertheless, a different conclusion can be reached when party identification is measured differently. Goldberg added in his 1992 survey a question relating to the depth of party identification: "To what extent do you identify with and are loyal to the party that you will vote for, or you intend to vote for, without connection to the platform and the candidates?"[7] This item was found useful in a multiple regression analysis concerning the voting for the two largest

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[2] A. Arian, *The Choosing People*, Cleveland, Case Western Reserve University, 1973, p. 225.

[3] ibid., p. 113.

[4] ibid.

[5] D. Caspi & H. Levinsohn, "To influence and to be Influenced: The Election Campaign to the 12th Knesset" in: D.J. Elazar and S. Sandler (eds.) *Who's the Boss in Israel?*, Detroit, Wayne State University Press 1992, p. 159.

[6] Goldberg, *The Israeli Voter 1992*, Jerusalem, Magness, 1994, p. 195. (Hebrew)

[7] ibid p. 196.

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parties – Likud and Labor. The strongest variable in the equation was attitudes towards the Jewish settlements in the administered territories (contribution of 33.27% to the explained variance); the next variable (contribution of 7.96%) was the perception on the increasing or decreasing of social and economic gaps between the two major ethnic groups (Orientals – Afro-Asians Jews, and Ashkenazim – American-European Jews); in the third step (contribution of 6.23%) appeared the depth of party identification.[8]

These findings, especially the gap between the ideological variable and the party identification variable, contribute to the conclusion that the influence of party identification is minor. The source for the contradictory findings is methodological. Public opinion surveys are doubtful research tools when party identification is concerned. An analysis of aggregate data is generally considered to be inferior to public opinion surveys. Nevertheless, in the case of party identification aggregate data can be more usable.

A recent study by Ventura on political socialization in Israel sheds additional light on the weight of party identification.[9] Ventura argued that in dominant party systems – such as Israel was until the mid-seventies – party identification is the main political message conveyed from parents to their children, while "in multi-party systems ideologically polarized along one major cleavage, parents will tend to transmit an identification with one of the ideological camps, in most cases using the 'left' and 'right' labels."[10] Since the mid-seventies the political system in Israel has changed from a dominant party system into a multiparty system, ideologically polarized along positions relating to the resolution of the Arab-Israeli conflict. Accordingly, the type of label that is transmitted has been changed from a party label into an ideological label of "left" and "right". The decline of party identification as well as the absence of the the Israeli-Arab conflict and the future of the administered territories as issues in the Histadrut elections, increase the likelihood of electoral volatility. Not only does party identification play a lesser role, but the influence of the ideological polarization between doves and hawks on the

[8] ibid p. 209.

[9] Raphael Ventura, "The Influence of the Close Family Circle on the Voting Patterns of the Individual in Israel" Tel-Aviv, Tel-Aviv University, Ph.D. dissertation, 1997. (Hebrew)

[10] ibid p. 3. (English Abstract)

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Histadrut elections is also diminished.

Since those two factors also existed in 1989, it is difficult to explain the stability of the Histadrut elections which were held in that year. However, three additional factors explain the electoral earthquake of 1994: a campaign dominated by one "easy" issue – an old-fashioned corrupted politics versus new and pure anti-politics trend; a colorful, young and strong political personality challenging the old regime of the Histadrut; and the fit between that personality – Ramon – and the main election issue; namely, the belief that Ramon was capable and determined to fulfill the anti-politics expectations and desires of the public.

The Participating Parties

A relatively high electoral threshold of three percent deterred the smaller parties from trying to take part independently in the elections. Each of the four lists which participated in the elections was made up from more than one party. Two tiny parties joined Labor: The Arab Democratic Party (in 1989 this party joined the larger Arab communist party, Hadash) and the newly born Yehud Party, a marginal splinter of Tzomef, a right-wing party. Tzomet itself, much larger than Yehud, joined the Likud in the 1994 Histadrut elections. In the Histadrut elections of 1989 the Likud (27.5%) was defeated by Labor (55%).

The Progressive List for Peace, a decaying small Arab party which failed to gain even one parliamentary seat in the 1992 Knesset elections, joined Hadash in the 1994 Histadrut elections. In the 1989 Histadrut elections all three Arab parties (Hadash, the Progressive List for Peace and the Arab Democratic Party) formed a united list which won 4.5%.

Ram consisted not less than five political organizations: The Ramon group which left Labor when Ram was formed; Shas – an ultra-religious Oriental party;[11] and the three parties which were part of Meretz – an electoral-parliamentary left-wing front created at the time of the 1992 Knesset elections – Mapam, CRM (Civil Rights

[11] Shas did not take part in the 1989 Histadrut elections, but then reached an early agreement with Labor. In that agreement Shas committed not to run independently and to formally declaring its support for Labor. Shas received in exchange some money and a few positions in the apparatus of the Histadrut.

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Movement) and tiny Shinuy. These three parties joined Ram as a single unit, although an internal agreement among them allocated about 60% to Mapam, 35% to CRM and 5% to Shinuy.[12] The allocation was based mainly on the 1989 Histadrut elections in which Mapam received 9%, CRM 4%, while Shinuy did not take part. According to those results Mapam was expected to gain about 70% in the joint list and CRM the remaining 30%. In the Knesset elections of 1988 – the last time that these three parties ran independently – CRM gained five seats, Mapam three and Shinuy two. Before the 1994 Histadrut election, Mapam agreed to compensate the other two partners by endowing each with an additional five percent. In this way the formula of 60-35-5 was determined. Mapam's participation in Ram was essential for the success of Ram, it being the largest and the richest party among the partners of Ram. On the other hand, this orthodox party was the furthest from rebelling against the Histadrut establishment. A few months before the formation of Ram, Mapam had to decide whether it would run with CRM in the Histadrut elections or independently. Its Convention favored a joint list with CRM in a 65-35 vote.[13] Only a few months later, when Ramon announced his entry into the race, Prime Minister Rabin tried in vain to persuade the delegates of the Convention not to cooperate with Ramon, but 61.3% voted in favor of cooperation with Ramon.[14]

Much more interesting than the relationships among the Meretz parties was the agreement among Meretz, Shas and the Ramon group in which Ram was founded. When existing parties form a joint list it is generally accepted that the basis for allocation will be the results of the previous elections. In the case of Ram that mechanism could not be used, since Shas did not participate in Histadrut elections (it took part in the Knesset elections of 1984 and 1988) and the Ramon group did not take part in any elections. That means, that estimates had to be made. The safest component in terms of electoral prospects was Meretz, especially Mapam. The Ramon group was the least safe in those terms. That was the reasoning behind the decision to allocate the resources inside Ram according to its gain in the elections. The

[12] Based on Mapam daily, *Al HaMishmar*, 11.5.94. (Hebrew daily)
[13] ibid.
[14] ibid. 13.1.94.

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primary assumption which was included in the agreement was 30% for Ram in the elections.[15] In case that Ram would receive less than 15% the proportions will be 60% for Meretz, 26.7% for Shas and 13.3% for the Ramon group. A result between 15% and 30% would mean that the proportions after the 15% barrier will be 40% for Meretz, 36.7% for the Ramon group and 23.3% for Shas. If the primary assumption of 30% for Ram is realized, Meretz would receive 15% (9% at the first phase and an additional 6% percent at the second one), while Shas and the Ramon group will each receive 7.5%. A result of more than 30% but less than 40% would lead to 70% for the Ramon group, 20% for Meretz and 10% for Shas. The next three percent – between 40% and 43% – will be divided by the Ramon group (83.3%) and Shas (16.7%). A result of 43% would lead to 17% each for Meretz and the Ramon group and 9% for Shas. The proportions above 43% will be: 45% for the Ramon group, 40% for Meretz and 15% for Shas. Ram was formed only at the Histadrut level. Its components did not cooperate at other levels. The Ramon group stayed in Labor, rather than creating a new party. Those agreements were relevant also to the allocation of the party financing by the Histadrut. One percent in the national institutions of the Histadrut meant a monthly income of about $10,000. For a full term of four years one percent leads into nearly half a million US dollars.

The Candidates

In previous Histadrut elections, primaries were not held. Nominating committees, usually including very few top leaders, were the special bodies that selected the candidates. The nominating committee was replaced from the seventies by larger party institutions, such as the central committee. The next stage at the national elections level was the primaries. The primaries method heavily penetrated in the nineties into the Israeli political arena. At the Histadrut level there was no interim stage of candidates selection through larger party institutions. The nominating committees were replaced at once by the primaries method. The discrepancy between the Knesset and the Histadrut levels in 1989 was explained by "... a lack of public interest in the Histadrut elections and consequent lack

[15] ibid. 9.5.94.

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of public pressure for change."[16]

It might be that the increase in public interest in the Histadrut elections of 1994 is connected to the democratization of the candidates selection method. One of the reasons for the rapid institutionalization and expansion of that method was the success of Labor in the 1992 Knesset elections. The first time Labor won the elections since 1973 was after the adoption of the primaries method in 1992. The Likud responded rapidly, holding primaries – won by Binyamin Netanyahu – in 1993. Hence, it was expected that the primaries method would be applied in 1994 at the Histadrut level by both large parties.

It is noteworthy that Labor, the most established and old-fashioned among the three large participating lists, was the most democratic in the stage of the candidate selection, while Ram, the youngest and most refreshing list, was the least democratic at that phase. Ramon was not chosen through any selection process; the allocation arrangement among the various components of Ram was a typical oligarchic process. Ramon entered the campaign just one month before the elections. Only two Knesset Members of Labor, Peretz and Avital, joined him.

Following the elections of 1992, Ramon – forty two years old at that time – was nominated as Health Minister. He tried to promote legislation which would transfer the finance of the health system from the organizations supplying those services to the State. Each citizen would be automatically eligible for medical care. The suppliers would receive financing from the State which would be responsible for collecting the fees from the citizens. Each citizen would be allowed to select his sick fund.

The largest sick fund was held by the Histadrut. This was used as the main mechanism for mobilizing members to the Histadrut, since it was impossible to receive medical care from its sick fund without membership in the Histadrut. The fees were collected by the apparatus of the Histadrut, not that belonging to its sick fund, while part of those enormous sums – about one third – were left in the hands of the Histadrut leaders. From the eighties the Histadrut lost

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[16] G. Goldberg and S. Tzabag, "The 1989 Histadrut Elections: Thunder Before the Storm'?", in: D. J. Elazar and S. Sandler (eds.) *Who's The Boss in Israel?*, Detroit, Wayne State University Press, 1992, p. 262.

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hundreds of thousands of members. Its financial position became terrible, as the State had to allocate special budgets for handling its decaying organizations.

Ramon's proposal aimed at a separation between the Histadrut and its sick fund and at transferring the collection of medical insurance fees to a State agency. That meant a deadly strike to the old system of the Histadrut. Ramon's proposal was supported by a majority in Parliament and in the cabinet, including Prime Minister Rabin. Peretz, who was at that time chairing the Knesset Committee for Labor and Welfare, tried to do his best to promote the legislation of his political ally. The Histadrut was fighting back against that legislation which could have heavily hurt its resources and influence. A few weeks after the primaries in Labor (in which Peretz lost to the incumbent General Secretary, Haberfeld), the Party Convention rejected the proposed bill. That was the second win of the old guard after the loss of Peretz in the primaries. In response to his defeat, Ramon preferred to resign from the cabinet. The only way left to save his reform in the health system was to capture the leadership of the Histadrut itself. Furthermore, a victory in the Histadrut elections could extremely improve the chance of Ramon to become the leader of Labor in the near future.

The nomination process in the Likud was oligarchic, too. The leader of the Likud in the Histadrut since 1985 was Shamai, a second-echelon Knesset Member. In 1989 he was nominated without contest.[17] In the 1994 elections, a brilliant Knesset Member, Shitreet, desired to run as the leader of the Likud in the Histadrut.

Shitreet is younger, much more known and popular among voters than Shamai. In spite of the fact that both are of Oriental origin, Shamai was perceived as an old-fashioned politician of the old guard, while Shitreet is perceived as a maverick star representing anti-politics sentiments. The difference between Shamai and Shitreet was similar to that between Haberfeld and Ramon. According to Shitreet,[18] when Shamai became aware of the danger reflected from his candidacy, he tried to enhance the primaries in order to avoid the participation of Shitreet. Since Shitreet did not take part in the

[17] ibid p. 261.
[18] A personal interview with Knesset Member Meir Shitreet, 9.6.97.

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primaries, Shamai was left the sole candidate. Thus, competitive primaries were not held and Shamai was declared the winner. Shitreet tried to convince the leader of the Likud, Netanyahu, to abolish this and to nominate him at the expense of Shamai. Shitreet argued that according to the polls he would be able to defeat Labor, while Shamai was going to be defeated, as in 1985 and 1989. Netanyahu sent Shitreet to appeal to the internal Likud court, but did not make efforts to assist him. The decision of the internal court was not to allow a contest between Shamai and Shitreet. According to Shitreet,[19] he could have easily built the Ram coalition before the decision of Ramon to enter the race. From the perspective of the Likud, it was a terrible mistake not to get rid of Shamai and give Shitreet a chance. It might be that Shitreet's candidacy could have prevented the forming of Ram by Ramon.

Labor held primaries among its 130,000 members who are Histadrut members. Primaries were held to determine the leader of Labor's national list: the leader of Naamat (the feminine organization affiliated to the Histadrut); as well as the local leadership (of the Workers' Councils and of the local feminine branches of Naamat). Local primaries were held in forty five localities, while in fifty nine localities early consent on one candidate avoided the need to hold primaries.[20]

Three candidates contested in the primaries for the leadership of Labor. The incumbent General Secretary of the Histadrut, Haberfeld, represented the existing establishment of the Histadrut and was openly supported by Foreign Minister Peres. Haberfeld was at that time sixty three years old. He is of Ashkenazic origin and is a resident of one of towns in the metropolitan area of Tel Aviv. He was nominated as General Secretary in 1992 when the former General Secretary, Kessar, was nominated as Transportation Minister in the new Rabin cabinet. Haberfeld was considered an old-fashioned politician of the old regime. He spent most of his political career as a trade union leader, mostly in the national leadership of the Histadrut.

His two contestants were younger Orientals from poor

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[19] Ibid.

[20] *Al HaMishnar*, 11.1.94 (Hebrew daily); *Yediot Achronot*, 10.1.94. (Hebrew daily)

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development towns in Southern Israel who spent most of their political careers as mayors and Knesset Members. Peretz came from Sderot and was forty years old. He was closer to Prime Minister Rabin than to Foreign Minister Peres. Since the late eighties he had been part of a new generation-oriented, dovish and reformist faction in Labor headed by Ramon, Beilin and Burg. From 1992 he chaired the parliamentary Committee of Labor and Welfare. The third candidate, Amir, was a pro-Rabin ex-Knesset Member from Dimona. The main competition was between Haberfeld and Peretz. Prime Minister Rabin did not announce which candidate he was supporting. Haberfeld gained almost two thirds of the vote - 62 (5%) – while Peretz received just slightly over a third – 34 (7%), and Amir gained 2.8%.[21] The establishment won this battle, bulater lost the war. It might be concluded that even democratic procedure such as primaries is not broad enough to defeat the establishment. A larger electorate is needed to achieve this goal. The fourth candidate in the 1994 Histadrut elections, that of the Arab list, was a Communist Jew named Gonen.

The Issues and the Campaign

Until Ramon's joining the race, the campaign was dormant since the two rivals, Haberfeld and Shamai, symbolized the bad old political order of the past.

According to tradition, Labor would win the Likud by a margin of a few dozen percentage points. As the first polls in which Ram was found as the coming winner were published, the whole campaign has was changed. Ram tried to increase the voter turnout,[22] assuming that part of the Histadrut members who do not take part in the elections are protesting against the leadership of the Histadrut and its nature. Labor desired to avoid an increase in the voter turnout. However, with those unpromising polls Labor had to fight back and to bring turmoil into the campaign. Since Ramon had a hugh advantage over Haberfeld and Shamai, Ram was emphasizing the personal dimension. Though the electoral method in the Histadrut is not personal, but more based on lists, Ram desired that its formal

[21] *Al HaMishmar*, 13.1.94. (Hebrew daily)
[22] *Maariv*. 1.5.94 (Hebrew daily)

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symbol at the polls should be Ramon rather than Ram, but a State court did not allow it.[23] Labor's propaganda tried to argue in response that Ramon's intentions as to the Histadrut were not sincere and that his main target was to become Prime Minister.[24] Rabin complained that the Ramon candidacy was damaging the peace process with the Palestinians, which was prospering at the time of the campaign. As the polls continued to show a clear-cut advantage to Ramon, Labor changed its position by adopting all of the reforms initiated by Ramon, including the most important of all – the separation between membership in the Histadrut and in its sick fund.

However, this strategy was not perceived as credible. Labor tried to argue that Ramon gave up too much to the ultra-orthodox Shas.[25] Labor tried to manipulate Ramon's young age by accusing him of intentions which would cause financial damage to the elderly who were dependent on the Histadrut pension funds[26] Labor strategy was aimed to break down Ramon's credibility by describing him as a corrupt politician.[27] Later on, Labor tried to accuse Ramon of being in cooperation with the Likud, stating that a coalitional agreement between Ram and the Likud had also been reached.[28] That step was taken in order to increase the weight of the party identification factor and reduce that of the personal one. Furthermore, one day before the elections Labor argued that supporting Ram means only twenty percent for Ramon, but much more – forty percent each – for Meretz and Shas.[29]

During the final days, the two top leaders, Rabin and Peres, were drafted into the campaign. Netanyahu was mobilized to save the Likud from a fiasco, employing traditional phrases such as "The National Camp" and putting Labor and Ram into a single category, "The Left",[30] in order to prevent voters who identified with the Likud from turning to Ram. Ram's success was determined by a combination of the most important issues – anti-politics, health

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[23] Ibid 26.4.94.
[24] Ibid., 21.4.94.
[25] Ibid., 4.5.94.
[26] Ibid. 1.5.94.
[27] Ibid 8.5.94.
[28] Ibid. 9.5.94.
[29] Ibid.
[30] Ibid.

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services, corruption, reform and renewal – and a personality who was perceived as being able to cope with those issues. Against such a combination there was no real chance for Labor or the Likud.

Voter Turnout

Rates of participation in the Histadrut elections tended to be very high in the fifties – 84.8% in 1955 for example. This began to decrease in the sixties – 77.6% in 1965 – and went on in the seventies – 69.1% in 1977. A drastic decline occurred in the early eighties – 56.4% in 1981. In the next two elections a stabilizing trend was found: 56.2% in 1985 and 57.3% in 1989. Two factors were supposed to bring a rise in voter turnout in 1994: the massive abandonment of the Histadrut, mainly by voters with a weak party identification, enlarged the share of members with deeper party identification who tend to participate in the elections more than those who left the Histadrut. The split in Labor which was the basis for the creation of Ram brought about a rise in the rate of competitiveness which had to enlarge voter turnout.

However, voter turnout dropped to 53.5% in 1994 – a negative record in the history of Histadrut elections. Voter turnout dropped by 11.6% among Arabs (from 65.1% to 57.5%) and by 6.2% among Jews (from 56.4% to 52.9%). But for the existence of both factors mentioned above, voter turnout could have dropped in 1994 to less than fifty percent. The average of the three largest metropolitan cities – Jerusalem, Tel Aviv and Haifa – dropped by 4.1% (from 50.9% in 1989 to 48.8%). The voter turnout was slightly higher – 51% – in 1994 in the development towns. Those towns are smaller and are populated mainly by poor inhabitants of Oriental ethnic origin and to a lesser extent by new immigrants from the Soviet Union.

Party Preference

The electoral earthquake was expressed by the defeat of Labor and the triumph of Ram. Labor dropped by 41% (from 55% to 32.6%). Ram won the elections, achieving 46.4%, as compared to 13% gained by Mapam (9%) CRM (4%) in 1989. According to the internal agreements concerning Ram and Meretz, the Ramon group gained 18.5%, Meretz 18.4% and Shas 9.5%. That means that the proportions among the Ram components were 40% to the Ramon group, almost 40% to Meretz and slightly more than 20% to Shas.

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The 18.4% that Meretz gained were divided in this way: 10.7% to Mapam, 6.6% to CRM and 1.1% to Shinuy.

The Likud dropped by a similar rate to that of Labor, 37% (from 27.5% to 17.4%). The Arab list dropped from 4.5% to 3.6%, but the fact that the Arab Democratic Party was in 1989 part of that list and turned to Labor in 1994 means that Hadash was not weakened at all in the 1994 Histadrut elections. Ram clearly won among Jewish voters – 49.4%, as compared to 30.3% for Labor, 19.5% for the Likud and 0.8% for Hadash. Nevertheless, Labor defeated Ram among Arab voters: 47.6% for Labor, 27.2% for Ram, 21.5% for Hadash and 3.7% for the Likud. The Arab voters (13.4% of the general electorate) tended to be less volatile than the Jewish voters. Labor lost 41% of its strength among Jews and less than 10% among Arabs.

The Likud lost more than one half of its share (7.6% in 1989) in the Arab sector. Four out of five Hadash supporters were Arabs, as compared to twenty percent of Labor supporters, less than eight percent of Ram supporters and less than three percent of Likud voters. At the Histadrut level, Arab voters tend to be less ideology-oriented than Jewish voters. The impact of material benefits on their electoral decision is larger than among Jews, mainly because their economic dependence on the Histadrut resources is greater than that of Jews. This explains the success of Labor, the governing party in the Histadrut, in retaining 90% of its share, as well as the drastic decline of the Likud following its loss of power at the national level in the 1992 elections.

The ethnic origin factor has been considered to be the most significant explanatory variable in Israeli politics since the late seventies. Orientals (Afro-Asian Jews) tend to vote for the right-wing Likud, while the Ashkenazim (American-European Jews) tend to support the Left, mainly Labor and Meretz. In a study on the Histadrut elections of 1989 it was found that Labor was doing well in Ashkenazic communities, while the Likud was gaining more support from Orientals than Ashkenazim.[31] But a comparison of the 1994 votes in the developments towns (10.2% of the voters) with the rest of the Jewish voters exposes unexpected results. There is a general

[31] Goldberg and Tzabag, ibid. pp 268-270.

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	Labor	Likud	Ram	Arabs	Total
Netivot 1989	57.0	40.2	2.2 (Mapam and CRM)	0.6	100.0
Netivot 1994	48.0	13.6	37.7	0.7	100.0
Ashdod 1989	51.0	38.9	9.5 (Mapam and CRM)	0.6	100.0
Ashdod 1994	32.7	22.4	44.3	0.6	100.0
Givaataim 1989	66.4	20.4	12.7 (Mapam and CRM)	0.5	100.0
Givaataim 1994	34.8	14.2	50.4	0.6	100.0
Ramat HaSharon 1989	58.9	15.0	25.2 (Mapam and CRM)	0.9	100.0
Ramat HaSharon 1994	23.7	14.3	61.4	0.6	100.0

Table 1. Election results in four localities (in percentages)
The 1989 results are based on *Histadrut Elections Results*, Tel Aviv. General Federation of Labor, 1989 (in Hebrew). The 1994 results are based on unofficial records of the Histadrut.

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pattern of electoral similarity between the development towns and the rest of the Jewish communities. Labor achieved 30.5% in the development towns and 30.2% among other Jewish voters. The Likud did only slightly better in the development towns – 22.1% to 19.2%, while Ram did slightly worse in the development towns: 46.4% to 49.8%. It seems that Ram attracted more Labor than Likud supporters in Ashkenazic communities, as well as more Likud than Labor supporters in Oriental communities. The examples of four towns – two Oriental development towns located in the periphery and two ashkenazic affluent towns near Tel Aviv – illustrate those trends.

Netivot is a small religious development town in southern Israel. Ashdod is not a religious town, and is larger, less poor and closer to Tel Aviv than Netivot. Givaataim is an affluent town near Tel Aviv. Ramat HaSharon is smaller than Givaataim. The population of Ramat HaSharon is younger than that of Givaataim. One of the residents of Ramat HaSharon is Ramon.

The losses of Labor in the affluent towns were larger than those in the development towns: 15.6% in Oriental and religious Netivot, 35.9% in Oriental and non-religious Ashdod, 47.6% in Ashkenazic and old Givaataim and 60% in Ashkenazic and young Ramat HaSharon. The losses of the Likud in the affluent towns were smaller than those in the development towns: 30.4% in Givaataim, 34.7% in Ramat HaSharon, 42.4% in Ashdod and 66.2% in Netivot. The deeper the religious basis of a town was, the more harmful to the Likud was the participation of Shas in Ram. The deeper the basis for Meretz success (Ashkenazic, affluent and young), the better the chance of Labor to resist defeat by Ram. In other words, the combination of liberal Meretz and ultra-orthodox Shas was very helpful to Ram.

To sum up, the two wings of the old Labor (the Ramon group and Lahor) gained together 51.1%, only 3.9% less than in 1989. This drop of 7% in its share was mainly in favor of Meretz. The second important result was the rise of Shas with 9.5%, mainly on the expense of the Likud. The successes of both Meretz and Shas were mediated through their cooperation with the Ramon group.

Split-Ticket Voting

Split-ticket voting is measured through an index ranging from 0 (no split-ticket voting) to 100 (maximal split-ticket voting). The rate

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of each community is calculated by summing the absolute value of the difference between the percentage attained by each party at the national and local levels and dividing the result by two.[32]

Many Labor supporters who voted Ram at the national level split their tickets by voting Labor at the local level. In 1989 the weighted average of ticket-splitters in the Jewish urban communities with more than 1000 voters was small - no more than 2.8%.[33] In 1994 this score strikingly increased to 17.7%. The average for the three largest metropolitan cities stood on 0.8 in 1989 and on 11 in 1994.

The degree of split-ticket voting is determined by various factors. Split-ticket voting tends to be high when the following five conditions are satisfied: non-ideological elections; personal candidacy is salient; elections are to different levels (such as national and local); elections are to different institutions (such as Parliament and Presidency); the chance to split the vote is not brand new (such as when a new electoral method is adopted), but rather it has existed for a long time.[34] Four out of the five conditions were existing in 1994: the elections were not held on an ideological basis; although the electoral method is not personal, the whole campaign was on that basis due to Ramon's candidacy; the elections were at different levels (national and local); split-ticket voting in the Histadrut elections became possible in 1977 and the new procedure has been highly institutionalized in the five elections of 1977, 1981, 1985, 1989 and 1994. In 1989 the procedural institutionalization was slightly smaller, the ideological dimension was more salient (since the 1994 issues of anti-politics, health services, corruption, reform and renewal were absent) and the factor of personal candidacy was much weaker than in 1994. The result was a steep increase in the degree of split-ticket voting.

Labor defeated Ram at the local level – 40.9% to 32.6%. The Likud, same as Labor, did better at the local level, gaining 21.9%. Labor lost 27% of its strength at the local level as compared to 41% at the national level. The Likud lost 21% of its strength at the local level and 37% at the national level. About one third of Labor and

[32] Ibid. p.273.
[33] Goldberg and Tzabig, ibid.
[34] Goldberg, ibid.

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half of the Likud supporters in the past who voted Ram at the national level stayed loyal to their original inclinations at the local level. It seems that those voters still identify with their old parties. The others voted Ram at both levels.

Labor retained its dominance among women at the voting for Naamat – the feminine organization of the Histadrut. Labor gained 50.1% (58.7% in 1989) as compared to 26.3% by Ram (13.3% for Mapam and CRM in 1989), 19.1% by the Likud (23.6% in 1989) and 4.5% by Hadash (4.4% in 1989).[35] Labor lost only 14.6% of its strength among women as compared to 41% at the national level, and the Likud lost 19% of its strength among women as compared to 37% at the national level.

It seems that about one third of the women who turned from Labor to Ram at the national level did the same at the Naamat level. This means that two thirds of those women who turned from Labor to Ram stayed loyal to their old party at the Naamat level. This trend might be explained by a desire to partly retain their party identification. In other words, they did not want to punish their party too much. In the case of the Likud, half of the women who turned from the Likud to Ram did the same at the Naamat level. The losses of the Likud to Ram were much higher among Oriental women than among Ashkenazic women: in Givaataim, for example, the Likud lost in 1994 only 12.2% of its support, in Ramat HaSharon it even grew slightly by 2%, while in Ashdod the Likud lost 20% of its support. It might be that women supporting Shas tended to go more strongly towards Ram than did other women.

Conservative women are less ready for split-ticket voting than modern women. The Naamat level was the most stable out of the three levels, while the national level was the least stable. The local level was more stable than the national level, but less stable than the Naamat.

Conclusion

The results of the elections for the Histadrut reflect, first and foremost, the erosion of its ideology and the weakening of the workers' status in Israel. That is to say, Israel with a weak Histadrut

[35] Based on unofficial records of the Histadrut.

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means a weak workers' status.

The 1994 verdict of the Israeli voters reflects a change in the power structure of the country, a drastic decline in party identification and, in addition, the profound change which is taking place in Israeli political culture. More then any other body, the Histadrut was the focal expression of Israeli party politics up till 1994. But that year was a turning point.

In the political sphere, Ramon's list succeeded against the dominant and most conservative element in party politics – the Histadrut party apparatus. Ramon had opposed everything the Histadrut represented up to that point, worrying little about the party apparatus antagonism towards him. The results of public surveys and positive responses of wide circles only strengthened his determination to run for head of the Histadrut, albeit against his own party, and at the same time to remain within it as a member. Ram, headed by Ramon, succeeded in creating the impression that the Prime Minister supported Ramon's candidacy in every realm related to the Histadrut and did not oppose his independent campaign. This vague message eased the mind of traditional voters of the Labor party who considered withdrawing their support from their 'mother' party. What further eased this transfer of allegiance was the corruption and mismanagement which spread throughout the Histadrut in its present form, versus the changes promised by Ramon. The relatively low percentage of participants in the recent elections can accordingly be understood as reflecting the ambivalent feelings of the loyal members of the Labor party toward hurting their party.

The dramatic change in voting behavior in the context of Ramon's victory can be seen as a tombstone erected on the grave of the old collective ideology and the socialist ideology, and as a shift toward the socio-liberal ideology, free-market economy, privatization, and the breaking of old party rules, stressing the personal aspect of election campaigns.

To conclude, if the election results of 1989 were the thunder before the storm,[36] in 1994 the storm set the floor trembling under Histadrut's infrastructure, bringing about an unprecedented failure of the Labor party to win a clear-cut majority, finishing with only a small

[36] G.Goldberg and S.Tzabag, ibid., pp. 251-253.

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minority percentage of votes – and this in the context of a constant erosion of the Histadrut as a focal power point in the Israeli political system.

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THE DISPOSSESSION OF THE AMERICAN INDIAN – AND OTHER KEY ISSUES IN AMERICAN HISTORY

Dwight D. Murphey, Ph. D., J.D.

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A Revolution in Progress: Today's Proliferating Science and Technology

Dwight D. Murphey
Wichita State University

The proliferation of science and technology in today's world is discussed and is illustrated by reference to current developments in such areas as miniaturization, photovoltaics, nonlinear equations, and materials science. Developments in information technology in computerization, robotics, and biotechnology are given especial emphasis.

Key Words: Science, technology, information technology, computer revolution, robotics, biotechnology, end-of-work.

The world is now witnessing a scientific and technological expansion that is proliferating at a speed unlike anything the human race has ever experienced. Although Milton Friedman has spoken of "a major industrial revolution comparable to the one that occurred two hundred years ago,"[1] even so telling a comparison is a serious understatement. The current revolution owes its existence to the first, which was itself vastly significant, but stands in relation to it as a raging forest fire to a campground bonfire.

Walter Wriston says "scientific knowledge is currently doubling about every fifteen years" [an apt description for which we should allow him poetic license even if it is a fallacious quantification]. In a 1992 book he says that "at least 80 percent of all the scientists who have ever lived are now alive. In our country at least half of all scientific research done since the United States was founded has been conducted in the last decade."[2] An essay by Mark Cantley in a recent book about biotechnology says that "the scientific method is one of the supreme achievements of human culture over the past five centuries. It is the direct lineal descendant of Renaissance

[1] Milton Friedman in a review of Sir James Goldsmith's *The Trap*, *National Review*, November 27, 1995.

[2] Walter B. Wriston, *The Twilight of Sovereignty* (New York: Charles Scribner's Sons, 1992), pp. 5, 102.

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humanism, in its self-reliant dependence on human observation and deduction. It is the most effective societal learning instrument ever developed."[3]

Science and technology advance together, interdependent and hardly separable. In his *Post-Capitalist Society* Peter Drucker provides an overview of the development of technology in the eighteenth and nineteenth centuries; there was during that time a "dramatic shift from skill to technology," and "the great document" of that shift was Diderot and d'Alembert's *Encyclopedie*, "one of the most important books in history" that "attempted to bring together in organized and systematic form the knowledge of all crafts." The industrial revolution caused one thing to feed on another: "technical change created demand for capital" and this "required concentration of production," which in turn "required large-scale energy, whether water power or steam power ...."[4]

There is a certain danger in giving examples of today's innovations and those expected for the future. Within a short time, those that come into being will be considered commonplace or, if supplanted by something later, merely elementary. The things we mention that don't eventuate will seem in hindsight to have been foolish pipedreams. Bill Gates of Microsoft was concerned about this in his book *The Road Ahead* when he said, "This is meant to be a serious book, although ten years from now it may not appear that way. What I've said that turned out right will be considered obvious and what was wrong will be humorous."[5] He went ahead anyway, and so will we here. Even though a look ahead is prone to error, it is better than to be blindsided by what's coming. And, quite apart from their value in increasing our understanding, the new developments are fascinating.

Technological miniaturization is well underway. A news report in March 1997 says engineers "are developing tiny aircraft" called "micro air vehicles." They will carry "cameras, chemical and biological

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[3] Mark Cantley, "Biotechnology in Europe," in *Biotechnology in Future Society* (Luxembourg: Office for Official Publications of the European Communities, 1989), p. 17.

[4] Peter F. Drucker, *Post-Capitalist Society* (New York: HarperBusiness, 1994), pp. 28-29.

[5] Bill Gates, with Nathan Myhrvold and Peter Rinearson, *The Road Ahead* (New York: Viking Penguin, 1995), p. xiii.

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sensors, radio transmitters and antennas," not to mention "sophisticated computer systems, using advanced artificial intelligence techniques." "To provide power, AstroPower Inc. of Newark, Del., is developing a minute solar panel that can be glued to the skin of the aircraft. Other models use tiny internal combustion engines that can operate on a thimbleful of fuel." The miniature airplanes will be usable for rescue work and a variety of military purposes.[6]

It is no wonder that a July 1997 news report says that "many future [space] flights will use miniature spacecraft, weighing barely 10 pounds and launched by rockets the size of a 5-gallon gasoline can." A poetic touch is added: "They will be guided by tiny thrusters with the power of 'a butterfly sneeze' ... ."[7]

In a totally different area, there is "a global boom in photovoltaics," with the market, still tiny, growing 30 percent a year. Semiconductors called photovoltaic cells are embedded into building materials to turn sunlight into electricity. The price is falling sharply, making such things as solar roof shingles and opaque glass facades affordable. The United States had 100,000 solar-powered homes in 1995 according to *Business Week*, and the number is growing. The solar panels no longer need to be architectural sore thumbs.[8]

A mathematical development that *Business Week* says "experts believe *will revolutionize engineering just as quantum mechanics has transformed physics*" [my emphasis] involves "nonlinear equations." The equations "are used for precisely describing the behavior of things with an unpredictable facet," which is to say, almost everything. They will be usable in widely varied areas: aerospace engineering, where they allow the simulation of the aerodynamics of the full airplane and not just the wings; biotechnology, where "geneticists are getting a better handle on the complex behavior of DNA"; automobiles, where the equations help design safer cars; finance, where "traders are using 'nonlinear optimization' algorithms to help maximize profits and minimize risk"; and manufacturing, where they are helpful both as to products and production processes.[9]

Another revolution (among the many simultaneous revolutions)

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[6] *Wichita Eagle*, March 16, 1997, report by Robert S. Boyd.

[7] *Wichita Eagle*, July 12, 1997, report by Robert S. Boyd.

[8] "Sunup at Last for Solar?," *Business Week*, July 24, 1995, p. 84.

[9] "Supermath for the Real World," *Business Week*, September 5, 1994, p. 80.

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is taking place in materials science. Harald Malmgren contrasts the traditional science that "used to process materials found in the earth" (which is what most of us no doubt think of as the manner of obtaining resources) with the new science that builds materials atom-by-atom to fill needs as they arise. The newly-created materials serve many uses. One is in ceramics "in extreme temperature applications such as high-performance, high-heat engines, packaging of integrated circuits and various types of sensors, and containment of space vehicle systems." New materials are also used as "optical fibers, superpolymers, and superconductors." The refrain is becoming familiar: "The materials revolution is transforming the fundamental landscape of our industrial structure."[10] An important example of this is reported in *Insight* magazine in August 1997 when it tells about an entrepreneur who has invented a way to make "ordinary concrete into a space-age material ... incredibly strong and inexpensive" [and also reducing pollution]. The new process in effect makes cement into pourable limestone that can be used for lightweight building materials. An additional use will be to make possible much safer long-term disposal of nuclear wastes than can be accomplished with cement.[11]

Scientific and technical research is progressing on a scale that involves ever-larger projects alongside the smaller-scale but still extremely innovative work such as that done by the entrepreneur just mentioned. (The science possessed by small American biotechnology firms is said by a Swiss researcher to be "fantastic" and "far better than what the [established] pharmaceutical industry has."[12]) A billion dollars is required to develop a new memory chip for computers, and $3 to 6 billion to come out with a new automobile platform. Clyde Prestowitz Jr. of the Economic Strategy Institute reminds us that this kind of spending is possible only because of vast product sales in a world market.[13]

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[10] Harald B. Malmgren, "Technology and the Economy" in *The Global Economy*, William E. Brock and Robert D. Hormats, ed.s (New York: W. W. Norton & Company, 1990), pp. 95-97.

[11] Gayle M. B. Hanson, "Like a Rock...Only Harder," *Insight*, August 4, 1997, p. 43.

[12] Quote from Dr. Jurgen Drews, president of international research and development at Roche Holdings Ltd. in Switzerland, in *Business Week*, "21st Century Capitalism" [no date or page citation].

[13] *Insight*, May 20, 1996, p. 25.

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Despite controversy over government's becoming involved in the economy through "industrial policy," the United States' "Advanced Technology Program" was started under the Bush administration and quickly grew to five times its original size under Clinton. It "helps fund small high-tech research that's so risky even venture capital firms are wary."[14] The main trend, however, has been away from government funding of research and toward privately sponsored research and development (R&D). Economist Murray Weidenbaum, viewing this favorably, says it "makes it more likely that there will be an accelerated flow of new and improved civilian products and production processes."[15]

There has also been a shift, in the United States at least, from basic to applied science. *Business Week* in 1994 criticized this shift toward near-term goals when it called it a search for "quick results." The magazine said that this was "the most sweeping redirection of U.S. science since World War II." There has been a refocusing of "America's 2.5 million scientists, 700 government labs, and hundreds of university labs," with "corporate labs ... leading the charge."[16] That the Congress cancelled the ultra-expensive Supercollider project reflects this new priority as well as budget imperatives. At the same time, Japan shifted its emphasis more toward basic science in the late 1980s, at least in part at the urging of the United States, which thought Japan had too long "freeloaded" off the science of other countries. Japan's Super Photon Ring project, costing more than a billion dollars, will "when it's opened in 1998 ... be the world's largest facility for short-wavelength radiation," according to *Business Week* in 1994.[17]

Information technology

Science, not computers, lies most broadly at the base of the accelerating increase in knowledge. And yet, computers and other information technology (such as satellites and fiber optics) have

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[14] *Wichita Eagle*, June 4, 1997, report by Tom Webb.

[15] Murray Weidenbaum, "American Isolationism Versus the Global Economy," *The St. Croix Review*, June 1996, p. 12.

[16] "Could America Afford the Transistor Today?," *Business Week*, March 7, 1994, p. 80.

[17] "Who Says Science Has to Pay Off Fast?," *Business Week*, March 21, 1994, p. 110.

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become pivotal to where the world is headed in most areas.

The central thing today is "information." Michael Porter says in *The Competitive Advantage of Nations* that "most industries are, or will become, high-technology or knowledge-intensive industries. Electronics, advanced materials, information systems, and other manifestations of modern technology are changing the product and the value chain in virtually every industry."[18] In manufacturing, the innovation is in the areas of both product and process technology, leading to a vast expansion of the products coming onto the market and ever-greater sophistication in how those products are produced.[19] The implications are far-reaching: a 1993 book says "the technologies alone are not enough. The technologies will have to be integrated into organizational frameworks that fully utilize the knowledge ... Even this is not enough. Industrial enterprises must have access to generic social resources--an appropriately educated workforce, adequate communication and information networks, a supportive political, legal, and economic climate."[20]

Recent developments include such things as "just in time inventory management," "statistical quality control," expert systems, artificial intelligence, computer-aided design (CAD), and computer-aided manufacturing (CAM). Ninety percent of American products now carry the Universal Bar Code. Electronic data interchange (EDI) is allowing suppliers to "network" with customers, calling into existence the "agile manufacturing" of customized products. *Business Week* tells of a specific case: "At the Ross/Flex in Lavonia, Ga., customers phone to discuss what valves they need ... The specs are entered into a CAD/CAM system to design a one-of-a-kind valve, and automated machine tools grind out the parts overnight ... [It's done at] about one-hundredth the time and one-tenth the cost of traditional methods."[21] In textiles, there are now microcomputerized sewing systems. And the machine-tool industry operates through

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[18] Michael E. Porter, *The Competitive Advantage of Nations* (New York: The Free Press, 1990), p. 624.

[19] H. Allan Hunt and Timothy L. Hunt, *Human Resource Implications of Robotics* (Kalamazoo, MI: W. E. Upjohn Institute for Employment Research, 1983), p. 15.

[20] Steven L. Goldman and Roger N. Nagel in *Competitiveness and American Society*, Steven L. Goldman, ed. (Bethlehem: Lehigh University Press, 1993), p. 187.

[21] *Business Week*, "21st Century Capitalism," pp. 158-9.

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computerized "numerical controls."

The rapid advance of information technology is illustrated by a December 1996 news report that Corning Inc. "churns out more than 5 million miles of optical fiber each year." "Already," it says, "more than 60 million miles of fiber have been installed worldwide." The number of phone conversations that can be carried has gone from 24 over a digital copper cable to 200,000 on just one optical fiber. In the laboratory, it is 20,000,000![22] *The Economist* puts this in different terms: "In 1960 a transatlantic telephone cable could carry only 138 conversations simultaneously. Now a fibre-optic cable can carry 1.5m conversations. And very soon a fibre the diameter of a human hair will be able to transmit, in less than a second, the contents of every issue *The Economist* has ever printed in its 153-year history."[23]

The near-term future will multiply these and other developments. Bill Gates and Craig McCaw have set up Teledesic Corp. for a $9 billion project that will put 840 satellites into orbit 435 miles from the earth beginning in the year 2000. The purpose will be to bring "fast Internet access to the entire world." We are seeing the "beginnings of mass-produced satellites."[24] In medicine, according to John Carey in *Business Week*, something called "telemedicine" will soon connect eight rural hospitals "through high-speed networks to a regional medical center." "Using video and computers, specialists ... will [from a distance] read x-rays, conduct heart exams, and even do psychiatric tests ...."[25] Fiber optics will continue to advance, with uses from "zapping tumors and gallstones to betraying an intruder ... detecting minute defects in bridges, guiding cars along an interstate, even performing surgery by phone to remote regions (with help from robotics, perhaps)," according to the same news report that told us of the expanding miles of optical fiber installation. Digital television will replace the original analog TV, beginning in 1998.

Further into the future--said to be more "hypothetical and

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[22] Associated Press report, *Wichita Eagle*, December 10, 1996, by Ben Dobbin.

[23] *The Economist*, "Survey of the World Economy," September 28, 1996, pages not numbered.

[24] Associated Press report "A Gamble for Billionaires" by Elizabeth Weise in the *Wichita Eagle*.

[25] *Business Week*, "21st Century Capitalism," p. 169.

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decades away from practicality"--major developments are expected in "nanotechnology," which is presently occupying more than 400 firms in the United States and the Nanotechnology Institute at Rice University. An organization called "Nanothinc" serves as a clearing-house for nanotechnology information. The prefix "nano" means one-billionth, so that a nanometer is one-billionth of a meter. The technology deals with things at the atomic level. A March 1997 news report says that "in theory, a computer put together atom by atom could pack more computing power inside a sugar cube than currently exists in the world." The technology hopes "to use individual atoms as if they were Tinkertoys to create new materials and products that in some cases ... could mimic living organisms, reproduce and even assemble still other objects ...."[26]

Computers

The erstwhile large size and bulkiness of computers began to disappear in 1958 with the invention of the silicon chip. But *The Economist* says "the computer revolution did not begin in earnest until Intel introduced the microprocessor in 1971." It adds that "the IBM PC (personal computer) was not introduced until 1982."[27] Astoundingly rapid progress has been made. We have already seen how Walter Wriston wrote in 1992 that "over the past three decades, computers have grown in efficiency more than a millionfold."[28] William Greider in 1997 wrote that for 30 years there has been a "quadrupling [of] the chip's capacity every three years, through a dozen generations," with the price of chips falling by at least half each time; and that "microprocessors have multiplied in power even faster than memory chips."[29] Nevertheless, even though we have come so far in such an incredibly short time, we still stand at no more than the threshold of the computer age.

Here are some aspects to be aware of:

. *Parallel processing.* A *Business Week* discussion of "The

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[26] *Wichita Eagle*, March 16, 1997, report by Reid Kanaley.

[27] *The Economist*, "Survey of the World Economy," September 28, 1996, pages not numbered.

[28] Wriston, *Twilight*, p. 21.

[29] William Greider, *One World, Ready or Not* (New York: Simon & Schuster, 1997), pp. 174-6.

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Information Revolution" says this is "the key technology pushing the power curve on upcoming generations of large-scale computers." It combines anywhere from two to hundreds of computers to work together. "In the not-too-distant future, parallel machines may be the only form of supercomputers, mainframes, or high-end network servers that survive." Eventually, even desktop computers, linked to a single chip, will use it.[30]

. *Object technology.* First developed in the 1980s, this breaks computer programs into building blocks named "objects." The objects can then be combined to make larger programs. Programmers don't have to recreate all elements of a program each time; they can use objects from other programs. It has several advantages over previous programming, not the least of which is that it makes programming much easier and faster.[31]

. *Speech recognition.* I mentioned earlier that predictions will soon seem either "old hat" or ludicrous, and we run that risk when I mention that speech recognition is expected to replace the computer keyboard within a relatively short time; i.e., by the middle of the first decade of the twenty-first century. Computers with limited speech-recognition vocabularies existed in 1994, but it was said then that "with every improvement in microprocessing power, scientists come closer to full speech recognition." Many more people will become involved when typing is no longer essential to computer use.[32]

. *Programmable automation; CIM.* This refers to "a family of technologies that lie at the intersection of computer science and manufacturing engineering." To say a machine is programmable is to say that it can be redirected easily from task to task. There is more flexibility for customized batch production than with "dedicated machinery" that performs a single task. The automation portion of the term refers to the fact that little human involvement is required. Cohen and Zysman in their 1987 book said "the real potential of the new production equipment comes from its integration. Imagine a fully integrated system linking design to manufacturing, permitting an automatic shift from one product to the next." This is called

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[30] *Business Week*, "The Information Revolution 1994," pp. 61, 63.
[31] *Business Week*, "The Information Revolution 1994," p. 64.
[32] *Business Week*, "The Information Revolution 1994," p. 68.

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"computer integrated manufacturing" (CIM).[33]

. *The "virtual office."* In more and more companies, employees are not given offices of their own; they operate, instead, out of their homes or out of office space they reserve as they need it (a process called "hoteling"). An employee who operates from home is "provided with a mobile office, complete with laptop, fax, and cellular phone," according to Jeremy Rifkin. He tells us that the accounting firm of Ernst and Young has moved to "hoteling," with only senior managers having a desk.[34]

. *Electronic money.* In a 1995 article entitled "The Future of Money," *Business Week* said "a rash of companies are developing their own forms of electronic money, known as E-cash." It reported that Citicorp is working on an "Electronic Money System" for computer-money that will originate with several banks. E-cash will make possible direct and instantaneous payments by computer without going through the banking system.[35]

. *"Virtual retinal display."* This may be the most startling innovation I have mentioned so far. A news report in January 1997 told how MicroVision is working on a device that uses fiber optic cables and "tiny, rapidly moving mirrors" to paint picture elements, called "pixels," onto the rear of a viewer's eye at the rate of approximately 18 million times a second. The result is "computer-generated images that users would perceive as real as the real world." The images "appear to hang a few feet in front of the viewer, strangely solid, though translucent." We can imagine many uses, but the report suggests one in surgery where "surgeons using minute cameras to guide their work inside the body would have the images float in front of them." As usual, the devices will be quite expensive at first.[36]

Robotics

There has been difficulty defining exactly what a "robot" is. The definition that was adopted by the Robot Institute of America (RIA)

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[33] Stephen S. Cohen and John Zysman, *Manufacturing Matters: The Myth of the Post-Industrial Economy* (New York: Basic Books, Inc., Publishers, 1987), pp. 152, 153, 161.

[34] Jeremy Rifkin, *The End of Work* (New York: G. P. Putnam's Sons, 1995), p. 150.

[35] *Business Week*, June 12, 1995, pp. 66-7.

[36] *Wichita Eagle*, January 12, 1997, Associated Press report by Elizabeth Weise.

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and became internationally adopted is that "a robot is a reprogrammable multifunctional manipulator designed to move material, parts, tools, or other specialized devices through variable programmed motions for the performance of a variety of tasks." Hunt and Hunt say that, accordingly, a robot "can perform the same task ... repetitively; it can perform different tasks on the same workpiece; or it can be reprogrammed to perform entirely new tasks."[37]

Robotics began slowly with the first industrial robot in the United States in 1959. Eleven years later in 1970 there were "perhaps a few hundred in use," and then by 1980 only 4,000, according to Leontief and Duchin. Robots were used primarily in four industries: foundry and casting, farm and garden machinery, motor vehicles, and aircraft. The U.S. had fifty or more firms making robots in 1985, but Paul Kennedy says they suffered "a drastic shakeout," so that none were left by 1991. In his 1993 book, Kennedy wrote that "it may take a generation or more before the robotics revolution makes its full impact." In the meantime, a labor shortage has spurred Japan into a massive use of robots. With the cost coming down sharply, "the economic advantages of employing industrial robots are now overwhelming," according to Paul Kennedy.[38] By July 1997 it was reported that there are 650,000 robots in the world economy.[39]

Robots are already performing a wide variety of tasks:

- For all welding and painting in the automobile industry.[40]
- For deploying cameras and mechanical claws to do repairs and maintenance in offshore oil drilling in deep water.[41]
- For harvesting cotton, wine grapes and almonds.[42]
- For fine-tuning television sets before they are sent to the buyer.[43]

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[37] Hunt and Hunt, *Robotics*, 1983.

[38] Paul Kennedy, *Preparing for the Twenty-First Century* (New York: Random House, 1993), pp. 85, 86, 94.

[39] Curt Suplee, "Robot Revolution," *National Geographic*, July 1997, p. 82.

[40] William E. Brock and Robert D. Hormats, ed.s, *The Global Economy: America's Role in the Decade Ahead* (New York: W. W. Norton & Company, 1990), p. 134.

[41] Kenneth Silber, "Big Oil Benefits From Info Age," *Insight*, December 30, 1996, p. 39.

[42] Letter to author from W. Edward Chynoweth dated January 20, 1997.

[43] *Business Week*, 21st Century Capitalism, p. 160.

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- For assisting banks with data storage.[44]
- For finding buried land mines.[45]
- For drilling cavities in femurs as part of hip replacement surgery.[46]
- For driving subway trains, digging mine shafts, cleaning up after nuclear accidents, mowing alfalfa and lawns, and even for military surveillance through robotic helicopters.[47]
- For cutting cloth with a laser.[48]
- For making molds.[49]

Even these are merely suggestive. Leontief and Duchin say that "increasingly, the stand-alone robot will be integrated with machine tools and other equipment into a computer-controlled system that is capable of combining product design ... with production planning and implementation ...."[50] This is to be expected, as the world moves into computer integrated manufacturing. The preceding list illustrates, however, that there are many uses outside of manufacturing.

As we have seen, the trend is toward miniaturization. A Japanese researcher says "the future lies in micromachines."[51] In February 1996, *Business Week* told of "tiny factories being built by scientists at Carnegie Mellon University," with minirobots assembling computer disk drives in a factory "roughly the size of a table top." The report says "CMU hopes ... tiny, portable factories will take on a wide variety of precision-assembly jobs ...."[52]

Biotechnology

The selective breeding of animals and use of organisms to make food and drink such as wine, cheese and bread have been with us a

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[44] *Business Week*, February 27, 1995, p. 99.
[45] Suplee, *National Geographic*, p. 79.
[46] Suplee, *National Geographic*, p. 81.
[47] Suplee, *National Geographic*, pp. 82, 84.
[48] Wassily Leontief and Faye Duchin, *The Future Impact of Automation on Workers* (New York: Oxford University Press, 1986), p. 32.
[49] Leontief and Duchin, *Future Impact*, p. 32.
[50] Leontief and Duchin, *Future Impact*, p. 32.
[51] Suplee, *National Geographic*, p. 87.
[52] *Business Week*, February 12, 1996, p. 91.

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long time.[53] What we today call "biotechnology," however, comes "from the discovery of two important new technologies in the 1970s, recombinant DNA (genetic engineering) and monoclonal antibody technology," according to Peter Daly in *Biotechnology in Future Society*. Other authors in the same book tell us that "in 1973, the first experiment to introduce extraneous pieces of DNA into a micro-organism from another species generated immense scientific excitement ... It had at last become clear that Watson's and Crick's discovery of the DNA double-helix in 1953, and the subsequent deciphering of the genetic code in the early 1960s, had given birth to a 'new biology' ...."[54] Mark Cantley says biotechnology has four characteristics that mold its place today: the drive for on-going scientific discovery that has come into being by "the cumulative (and recently accelerating) progress in the life sciences"; relentless competition that spurs on advanced technology; the desire to take action against world hunger; and, pulling in the other direction, the fear that people feel toward some innovation.[55]

In late 1994, *Business Week* reported that there were by then 1,000 biotech companies, either public or private, with a total of $20 billion invested. Nevertheless, it said, investors were increasingly skittish, worrying that biotech was "still peddling dreams."[56] Biotechnology in both Europe and Japan progressed slowly; it is mainly the United States that so far has pressed forward with it.

In all of these matters, though, things change quickly. Biotech already does a great deal even though it may not yet live up to the true-believers' most radical expectations; and the potential for the future is amazing.

"What biotechnology does already" is a large subject.

In medicine, "the development of monoclonal antibodies is providing precise and effective diagnostic tools, and the basis for delivering drugs to precisely targeted cells in the body." Progress is being made *vis a vis* cancer: "Since 1982 an extraordinary amount of

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[53] Ned Hettinger, "Patenting Life: Biotechnology," *Boston College Environmental Affairs Law Review*, Winter 1995.

[54] *Biotechnology in Future Society*, Yoxen and Di Martino, ed.s (Luxembourg: Office for Official Publications of the European Communities, 1989), pp. 37, 87.

[55] Mark Cantley in *Biotechnology in Future Society*, p. 15.

[56] *Business Week*, September 26, 1994, p. 84.

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progress has been made in our understanding of the molecular basis of cancer through the discovery of oncogenes. This period has seen the introduction by pharmaceutical companies of alpha-interferon products for leukaemias and Karposi's sarcoma ... A completely different approach to cancer therapy is the use of monoclonal antibodies to target chemotherapeutic drugs, toxins or radionuclides to tumour cells."[57] *Business Week* reports that human trials are being done on over 100 products, which "include new childhood vaccines, several anti-cancer agents, a herpes vaccine, multiple-sclerosis treatments, and neurological agents for conditions such as Lou Gehrig's disease." It says three drugs produce revenues of more than $1 billion: "erythropoetin to fight anemia, alpha interferon to treat cancer and hepatitis, and human insulin for diabetes."[58]

In agriculture, according to Pascal Bye, productivity has been rising because of "new varieties of seeds; advances in animal genetics and stockbreeding, complemented by the use of growth hormones...; an increase in the protein, carbohydrate or lipid content of plants; improvements in fermentation processes; and the extraction of greater value from by-products."[59] World food production has been almost doubled since 1973. In late 1996, it was reported that "today, the 5.8 billion people on Earth have, on average, 15 percent more food per person than the population of 4 billion did two decades ago."[60] Rifkin speaks of pest resistant genes to ward off the effects of drought and extreme temperatures. He tells how hens are induced to lay more eggs by eliminating their prolactin hormone, thereby reducing their "brooding instinct."[61] Monsanto Co. is selling a type of corn that is genetically engineered to fight off the European corn borer, which until now has cost growers damage of about $1 billion per year.[62] A development which saves farmers considerable costs and is at the same time environmentally helpful is that "global positioning satellites" are being used to divide farm fields into square-

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[57] *Biotechnology in Future Society*, pp. 16, 41, 42, 44.

[58] *Business Week*, "21st Century Capitalism," p. 168.

[59] Pascal Bye, "Biotechnology and Food/Agricultural Complexes," *Biotechnology in Future Society*, p. 68.

[60] *Wichita Eagle*, November 12, 1996, report by Knight-Ridder News Service.

[61] Rifkin, *End of Work*, pp. 120, 122.

[62] *Wichita Eagle*, December 25, 1996, Associated Press report.

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foot grids and then, using computers, to inform the farmer about what parts of the field need more fertilizer, pesticide, herbicide or water.[63] This has been given the name "precision farming."[64] Tomatoes are genetically altered so that they are slower to spoil; and "genes can be moved directly between the plant and animal kingdoms...For example, tobacco plants have been made to glow after a firefly gene was inserted into them."[65] Biotechnology is used not just to increase yields, but also to improve foods' desirability and nutritional value.[66]Because strawberries and ornamental plants are attacked in Florida by the spider mite, biotechnologists at the University of Florida have genetically altered a cousin of the spider mite to cause the cousin to prey upon it.[67]

What biotechnology offers for the future goes far beyond the things just mentioned. A news report in late 1996 said "scientists in Africa, Latin America, Asia and elsewhere are developing 'super rice,' wheat and cassava strains that can 'break through the yield ceiling' and new fish varieties that can double the returns of small aquaculture farmers." It says " ... a 'super cassava,' a root crop similar to a potato, recently has been developed that increases yields more than tenfold. Cassavas are eaten by 300 million poor people in Africa alone."[68] Scientists are working on "genetically engineered farm animals with double the standard amount of meat," as demonstrated already in the laboratory by mice that are two to three times larger than regular mice.[69] There will be potatoes with more starch and pigs with an improved ratio of protein to fat.[70]

In agriculture, the "factory farm" portends actually to replace outdoor farming, as radical as that no doubt seems. Rifkin says laboratory cultures will replace land cultivation, and cites an example of how 70,000 farmers on Madagascar who have raised 70 percent of the world's supply of vanilla will very likely be replaced by "a bacterial bath," produced in the laboratory, that will eliminate "the bean, the

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[63] *Wichita Eagle*, February 12, 1997.
[64] Christine Lutton, "Cyberfarm," *Forbes*, July 15, 1996, p. 86.
[65] Hettinger, *Boston College Environmental Affairs Law Review*, Winter 1995.
[66] *Business Week*, April 1, 1996, p. 67.
[67] *Business Week*, February 12, 1996, p. 91.
[68] *Wichita Eagle*, October 28, 1996, report by Associated Press.
[69] *Wichita Eagle*, May 4, 1997, report by Los Angeles Times/Washington Post Service.
[70] Hettinger, *Boston College Environmental Affairs Law Review*, Winter 1995.

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plant, the soil, the cultivation, the harvest, and the farmer."[71] This sort of change is already occurring in fishing, where Norway, Chile and Japan have gone heavily into farm-raised salmon, causing the world price of salmon to fall.[72] State biologists in Athens, Georgia, are working to create "a race of superbass" by cloning huge brood fish.[73]

What we just saw about developments in medicine will look primitive compared to what is coming – if society doesn't opt to curtail what's done. A press report in October 1997 says "British scientists have created a frog embryo without a head, a technique that conceivably could lead to the production of headless human clones to grow organs and tissue for transplant." A human embryo could be genetically engineered "to suppress growth in all the parts of the body except the bits you want, plus a heart and blood circulation." Thus, each person could have a genetically compatible organ-farm, so to speak; it would be like a plant, having no feeling because it would lack a head and central nervous system.

Rifkin raises the issue of what role the genetic engineering of human beings should play in society even in the near future.[74] Prospective parents may well choose to remove any propensity their offspring have to a variety of diseases. But what about pre-determining the offspring's height? Beyond that, what about intelligence? One can imagine a genetically-engineered race of superhumans who might have no species-identification with other human beings or with the human beings of the past. If that happens, one can reasonably presume that they will accept it as natural to dominate their inferiors. Here, the ethicist might well have good reason to worry about "fascism."

Some Implications

With each of these revolutions, the world is barely into it. New developments are announced every day, but they have hardly begun to be put into practice or to change organizations to bring their full

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[71] Rifkin, *End of Work*, pp. 123, 124.
[72] *Wichita Eagle*, October 14, 1996, report by New York Times News Service.
[73] *Wichita Eagle*, June 8, 1997, report by Knight-Ridder News Service.
[74] Lecture by Rifkin at Wichita State University, October 17, 1997.

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fruition. We see this in the building trades: despite all of the remarkable new materials produced by "materials science," most contractors are still using the same materials they have used for many years. The "world as it is" amounts to a heavy drag on innovation, producing an inertia in favor of the way things have been done before. Time is also required to raise and apply capital, to retrain people, to alter organizations, to adapt the law. This comes up against the exponential growth of knowledge and the relentless competitive pressure of the market, now more-and-more global. The result is a process of change far more rapid than humanity has ever known in its history, and yet seemingly slow to the individuals who live within it. Over time, however, those individuals will find their lives massively altered by the ever-continuing flow of incremental changes.

Fewer workers will be needed for the tasks done by robots and computer integrated manufacturing. Science and technology will increasingly produce substitutes for human labor. This points to a small, but growing, cloud on the horizon. It will eventually become a tornadic wall-cloud. Although it is being felt already on the European continent, it is not especially evident to people in the United States and England, where unemployment figures remain low. There, it is mainly being experienced as "churning," the laying off of many workers and middle managers, who either drop out of the work force through early retirement or as "discouraged workers," are picked up as employees in newly developing areas, or become "marginalized" in temporary and contract work or as "underemployed workers." As the non-labor-intensive technology continues to become integrated into the economy, these effects will be multiplied many times over. The "downsizing era" has just begun.

Jeremy Rifkin notes that during the fifteen years from 1974-1989, "more than one million jobs were lost in the steel industry in OECD nations" because of increases in productivity.[75] William Greider mentions that Michelin "went on-line in early 1994" with a tire-production factory that uses computer integrated manufacturing-and employs "only fifty workers." He refers to the concept of a "lights

[75] Rifkin, *End of Work*, p. 135.

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out" factory in which "the last worker to depart turns out the lights."[76] It is no wonder that Robert Reich can say that "routine production jobs ... will continue to decline sharply as computer-integrated robots take over." This includes lower- and middle-level management positions, in which "more than 780,000 foremen, supervisors, and section chiefs lost their jobs through plant closings and layoffs" between 1981-1986.

Even service workers that Reich calls "in-person servers" will see their jobs vanish: "Automated tellers, computerized cashiers, automatic car washes, robotized vending machines, self-service gasoline pumps ... Even telephone operators are fast disappearing, as electronic sensors and voice simulators become capable of carrying on conversations ... Retail sales workers ... are similarly imperiled ... tomorrow's consumers will be able to buy furniture, appliances, and all sorts of electronic toys from their living rooms ..."[77]

When technology in the world economy displaces work in Asia, Africa and Latin America, this will create a distributional crisis affecting billions of people, despite the vast productive potential of the technology. A result will be strong pressures toward the migration of large numbers of desperate people into the advanced economies. All of this takes us into subjects that are of great importance but that are beyond the scope of this article. The author is currently working on a book exploring these many implications and their possible solution.

The incoming technology has "utopian" potential to improve living standards, lengthen the span of human life, and even improve the environment. But economic systems, ideologies, political structures, ways of life, and cultural and spiritual values will all be tossed about like so much chaff. The age we are entering upon is full of danger and incredible opportunity.

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[76] Greider, *One World, Ready or Not,* p. 115.

[77] Robert Reich, *The Work of Nations* (New York: Vintage Books, 1992), p. 214.

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BOOK REVIEWS

The ABM Treaty Charade:
A Study in Elite Illusion and Delusion
William T. Lee
Council on American Affairs 1997 ISBN 0-930690-54-0

Today, when the proliferation of weapons of mass destruction is once again in the forefront of defense considerations, this book makes salutary reading. Not only does it document false U.S. negotiating policies during the Cold War, it also draws attention to the continuing constraints on U.S. military development still surviving from that period. All this is in the face of direct evidence for the export of missiles and missile technology from the former USSR and from China. It will consequently be useful in this review to condense the contents of this definitive survey of the history of the ABM Treaties – which still restrict the development of American military technology – by a former Defense Intelligence Agency expert on missile warfare.

By the late 1950s, the U.S. had no Anti-Ballistic Missile (ABM) defenses, whereas the heavily-armed Soviets had complex, fixed ABM site systems not only for the defense of Moscow but also Surface-to-Air (SAM)/ABM systems for national deployment. The mission of the Moscow ABM defenses was to buy enough time for the *nomenklatura* to get to their shelters to manage a nuclear war. The mission of the dual purpose NABM was to limit damage to critical national political, military, and economic assets in the course of a nuclear exchange. The Soviets put the best technology they had into the Moscow ABM defenses, and the best they could afford into their NABM systems.

The original Moscow ABM system consisted of huge phased array battle management radars and the long range Galosh interceptor carrying a multi-megaton warhead. Soviet Nationwide ABM system (NABM) consisted of the dual purpose SA-5 and SA-10 anti-aircraft and missile (SAM/ABM) systems, the Hen House and LPAR battle management radars to provide essential target tracking data, and a command control system integrating both NABM and the Moscow ABM defenses. As in the case of air defense, the Soviets

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judged that any NABM, even when not effective by U.S. standards, was better than none, and consistently fielded the best they could.

Given the gaps in U.S. technical intelligence collection, whether the Soviets were deploying only air defense or dual purpose SAM/ABM systems really was a 50-50 proposition for two decades. But CIA consistently interpreted the gaps as proof that all the systems were only for air defense and early warning of U.S. ballistic missile attacks. As evidence supporting the SAM/ABM interpretation accumulated, CIA failed to re-evaluate its previous assessments. The evidence shows that the Soviets were violating Article 1 of the ABM Treaty prohibiting NABM while they negotiated the ABM Treaty, and that they continued to do so until the demise of the Empire.

In 1963-64 the U.S. suddenly gained a 20 year technological advantage in ABM defenses. But the U.S. sacrificed its superior NABM technologies on the altar of the doctrine of Mutual Assured Destruction (MAD), served by its "handmaiden", "arms control". The Soviet military's objective was to gain as much advantage as possible from "arms control" agreements. The ABM Treaty was a strategic imperative dictated by the prospect of U.S. deployment of NABM that would have denied Soviet strategic objectives for at least 15 years, and by the Soviet 20 year lag in ABM technology.

The ABM Treaty did nothing to constrain FSU ABM programs in the USSR. Aside from poor management in the 1960s, the principal constraints on all FSU ABM programs were technological, especially their lag in microelectronics, which was the bane of all Soviet weapons development after the mid-1960s.

None of the "arms control" agreements constrained the buildup in Soviet strategic offensive missile and air forces. The Soviets negotiated the terms of the 1972 Interim agreement and the Salt Arms Limitation Treaty (SALT) to ratify acquisition of the missile and bomber arsenals required to satisfy their nuclear-targeting objectives. Nearly 6,000 of these weapons, 80 to 90 percent of Soviet Intercontinental Ballistic Missile (ICBM) forces and roughly half their total arsenal were designed to destroy all the U.S. land-based missiles, nuclear weapon storage, command-control, and other hard targets – an outcome SALT was supposed to prevent.

The Politburo bankrupted the FSU to pay for these forces, following its policy of preferential growth of military expenditures at the expense of the standard of living of Soviet citizens throughout the

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"arms control" era. The military burden rose from about 10-12 percent in 1968 to 30 percent (or more) of FSU GNP in 1988-90 while consumption declined from more than 55 percent to little more than 40 percent of FSU GNP.

The CIA bears primary responsibility for the intelligence contribution to U.S. self-deception in the initial SALT negotiations with erroneous assessments of Soviet: nuclear doctrine and strategy; strategic offensive missile force development; ABM programs; the Politburo's motivations for entering into SALT, particularly the myth that the Soviet leaders sought to reduce the military burden on the economy, and the role of the Soviet military in the "arms control" process.

All of President Johnson's top national security advisers shared CIA's erroneous estimates of the Politburo's motivations, policies, and objectives in whole or for the most part.

Neither the ABM Treaty nor any other "arms control" agreement did anything to deter the Politburo from approaching the nuclear brink in 1981-84. By ensuring that the U.S. was vulnerable to Soviet counterforce strikes and totally defenseless against ballistic missiles, "arms control" agreements and Treaties actually pushed the hands of the clock closer to midnight in 1981-84. The CIA now admits that there was some sort of crisis at the time, but still insists it was not all that serious.

In sum, the U.S. achieved none of the objectives it sought through strategic "arms control" agreements. It was the growth in the military burden during the SALT era was one of the root causes of the fall of the Soviet Empire. Had "arms control" constrained the FSU military burden near the 1968 level as the CIA expected, both the Empire and the Cold War probably would still be with us.

Beyond the approximate number of ready (on launcher) strategic nuclear delivery vehicles, the U.S. was unable to verify most important provisions of SALT agreements and treaties. While the U.S. detected several FSU ABM Treaty violations, such as extensive testing of the SA-5 in the ABM mode and the Krasnoyarsk radar, protests eventually were lodged only after divisive internal debate. All U.S. protests were ignored until the Empire began to collapse.

After the U.S. protest in 1975, Soviet measures to limit U.S. capabilities to detect testing of the SA-5, and then the SA-10, in the ABM mode limited U.S. evidence to "circumstantial". The Soviets

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ignored protests on the Krasnoyarsk radar for years while U.S. "arms control" advocates duplicated the General Staff's cover story that it was just an early warning radar. The U.S. failed to detect the most serious and blatant violation of all: NABM deployment and modernization in violation of Article 1 of the ABM Treaty.

Both the 1972 Interim Agreement and the SALT Treaties were so designed to accommodate Soviet strategic ballistic missile force objectives, and so full of loopholes, that extensive violations were not necessary. The U.S. failed to enforce those that did occur. Encryption of Soviet telemetry never ceased. Deployment of mobile SS-16 missiles was not officially detected.

When the cost to technical intelligence collection systems is taken into account, the U.S. spent billions trying to verify the "arms control" agreements with the FSU. Throughout the Cold War the KGB waged a disinformation campaign on arms control consisting of: "active measures" supporting and influencing what Lenin termed Western "useful idiots".

After Gorbachev's desperate attempt at Reykjavik to stop the U.S. Strategic Defense Initiative (SDI) program with the lure of abolishing nuclear weapons failed, the Soviet economy began to collapse under the combined burden of the military and agriculture expenses – at least 45 percent of Soviet GNP going down the tube for no economic return – major Soviet concessions on arms control soon followed: the INF, START I, and CFE Treaties, and dismantling the Krasnoyarsk radar.

In sum, the author argues, the U.S. should face up to the facts: a) the ABM Treaty never was a valid contract; b) the U.S. cannot have the Treaty and either effective TABM or NABM too; c) the entire strategic "arms control" process has been nothing more than a middle class welfare program in the U.S. government, academia, and other institutions that wasted the money of taxpayers. Inasmuch as the Soviet Union ceased to exist five years ago, the SALT and ABM Treaties should be declared null and void in accordance with established principles of international law.

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THE ABM TREATY CHARADE:
A Study in Elite Illusion and Delusion

William T. Lee

Former CIA and DIA analyst of Soviet and U.S. missile programs

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Foreword by William R. Graham; Acronyms and Designators; Personalities; "Arms Control" Illusions and Realities; FSU ABM Programs from World War II to 1968; Initial Development of the Moscow ABM System; Initial Stages of NABM Development; ABM Nuclear Warhead Development; 1967 - Crisis in Soviet ABM Programs; Lacunae in the Russian Records; U.S. ABM Programs in the 1960s; The SALT ERA; Sacrificing U.S. ABM on the Altar of MAD; Modernizing Moscow's Defenses; Modernizing NABM; Other FSU Strategic Defensive Programs; "Arms Control" of Strategic Ballistic Missiles; The ABM Treaty and The Real Brink of Nuclear War; Gorbachev, and the Demise of the Empire; Corroboration of LPARs As Battle Management Radars; Dual Purpose Design of the SA-10; Transforming "SAMs" into Regional ABMs; Verification of "Arms Control" Agreements; ABM Treaty Violations; Violations of Strategic Offensive Force Agreements; The Current U.S. Predicament; START II; Conclusions.

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